

# Compressed Air

AUGUST 1957

## Magazine

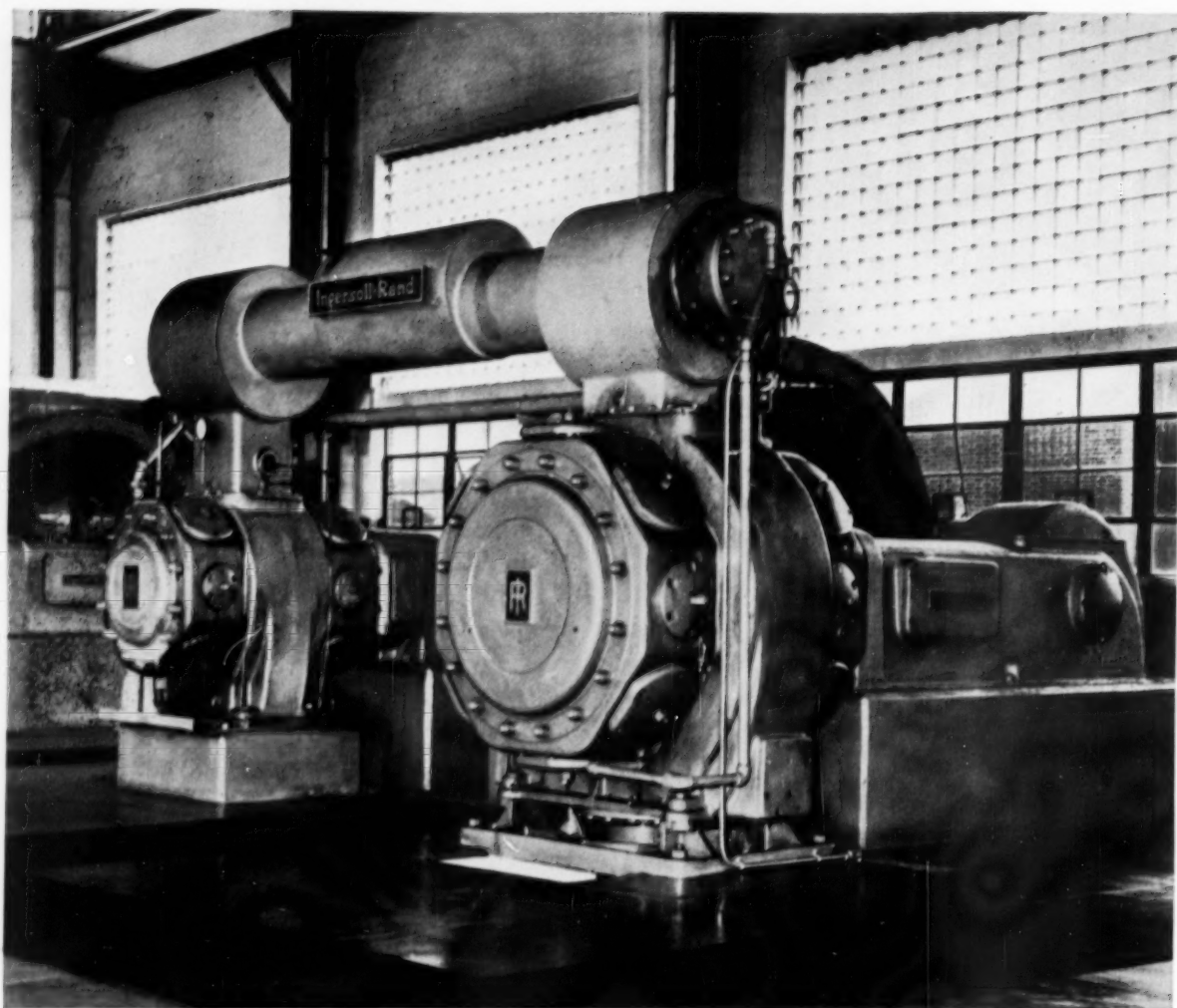


SANDBLASTING AT  
PEMAQUID POINT  
Coast Guard Crew Cleans  
Picturesque Maine  
Lighthouse

(SEE INSIDE PAGE AND PAGE 246)

VOLUME 62 • NUMBER 8

NEW YORK • LONDON



## DOES YOUR OIL FULLY PROTECT YOUR COMPRESSORS?

Does it prevent rust and harmful deposits . . . does it do a complete lubricating job under the severest conditions? Yes—if you use *Texaco Regal Oil R & O*.

*Texaco Regal Oil R & O* is fortified with additives that (1) protect compressor systems from rust and harmful deposits, keep lines, rings, valves open and running clean; and (2) assure proper lubrication under all conditions.

There is a complete line of *Texaco Regal Oils R & O*

for every type and size of air compressor, every operating condition.

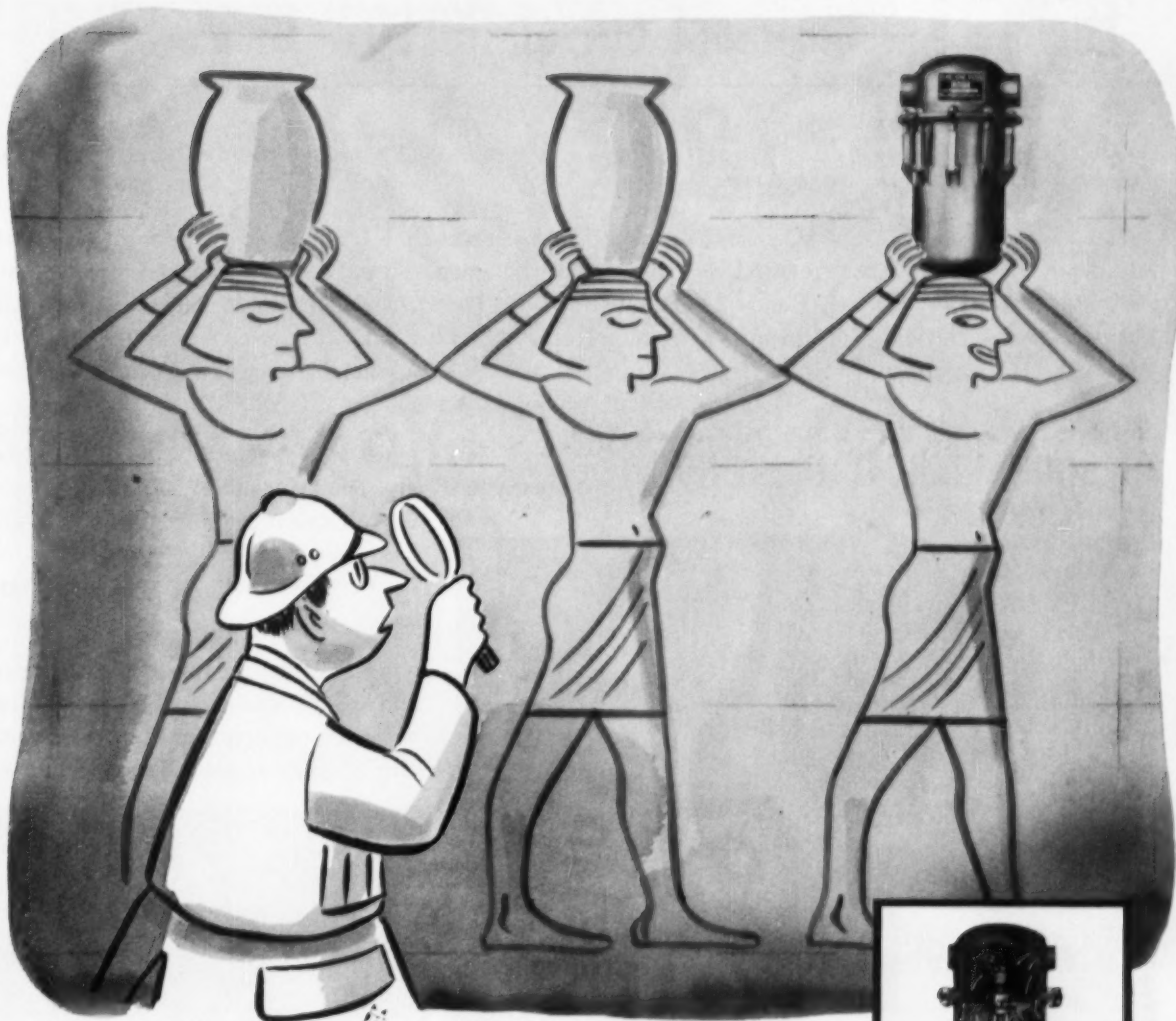
A Texaco Lubrication Engineer will help you select the right lubrication for your compressors. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.



**TEXACO Regal Oils R & O**  
FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS





## KEEP IT CLEAN by Phil Tration

... And the inscription read, "Many a young pharaoh has gained great riches by placing a Staynew filter in the proper place at the proper time."

Seriously, can you imagine how advanced the art of filtration would be today if the Egyptians *had* known about Dollinger Staynew filters? Dollinger is only thirty five years old, and yet Staynew Filters are the recognized standard of quality throughout the world. Moreover, Dollinger Engineers are constantly developing new filters for new applications, and increasing the world's knowledge of this very new art—filtration. May we help you?



### STAYNEW MODEL CPH PIPE LINE FILTER

has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This "double action" design eliminates need for frequent cleaning.

Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer ... or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 7 Centre Park, Rochester 3, N. Y.



**STAYNEW**

**DOLLINGER**

**FILTERS**

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

# how to get the most out of HOLLOW DRILL STEEL

Cutting drilling costs takes three things — quality drill steel, good shop practice, and care in the field.

The requirement of quality steel has been well taken care of by new alloy rods — Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods. But even the best, toughest steel requires some care.

## *Take, for example,* **FORGING AND HEAT TREATING**



Outside of breakage caused by down-right abuse, most hollow drill rod failures are caused by improper forging or heat treating.

Failures due to heat treatment are generally fatigue failures occurring in the region of the rod where the forging, normalizing or hardening heat runs out. This is the "soft-zone" between the part of the rod that is heated to the desired temperature and the part that remains cold. To eliminate unnecessary failures, it is important that manufacturer's data

sheets or field representative's recommendations be followed closely.

**ANNEALING** — If any forging is performed prior to machining, the end should be allowed to cool in air until black. It should then be reheated to slightly above critical temperature and allowed to cool slowly in a good insulating material such as mica or ground asbestos.

A good practice is to put the rods in the insulation early in the afternoon, and allow them to cool slowly until the next morning. When the rods are removed the ends should still be too hot to handle comfortably with the bare hands.

As a leading producer of drill steels, and other special purpose steels, Crucible welcomes the opportunity to work with you in solving problems as they arise.

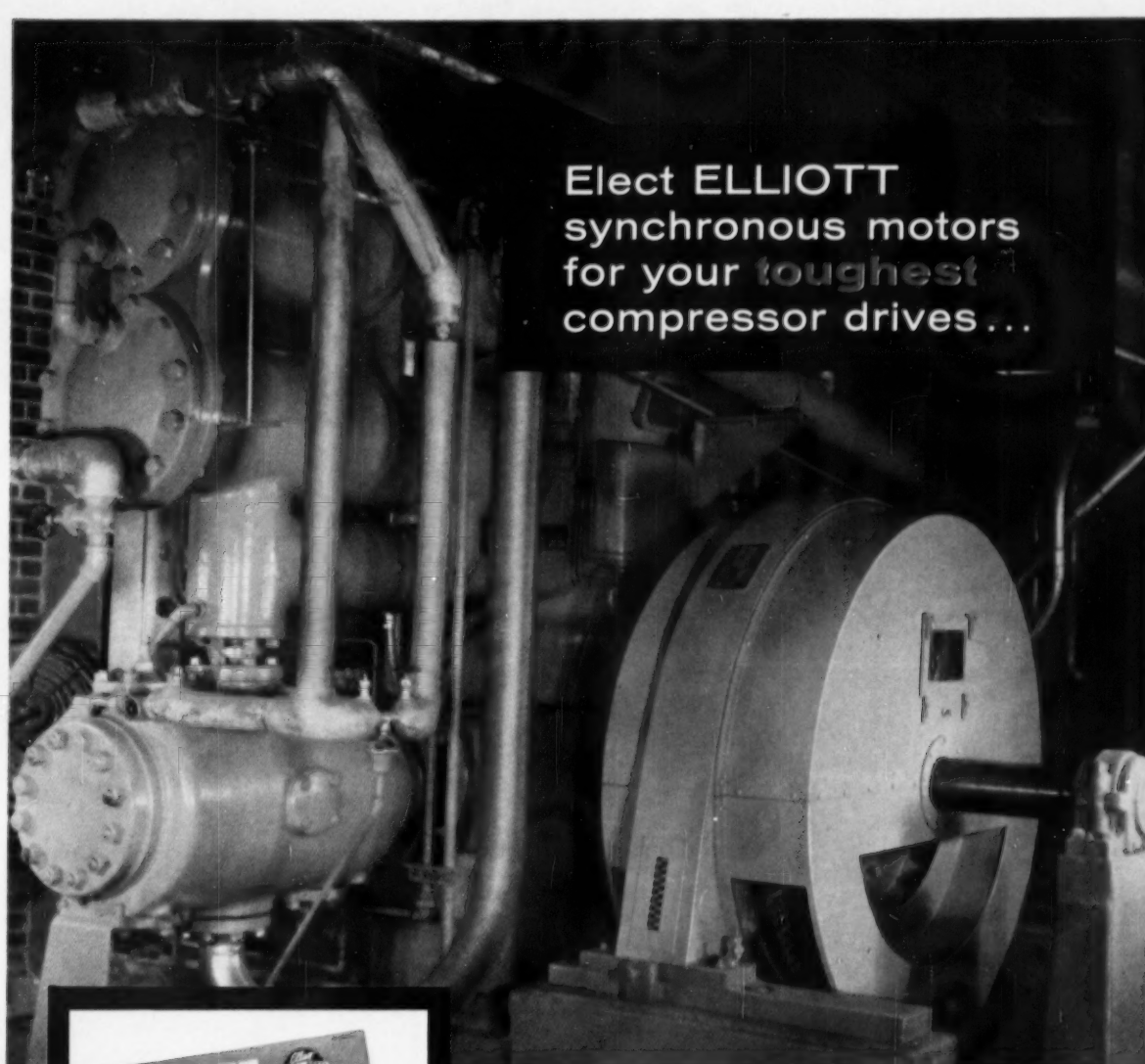


Call your nearby Crucible representative for help with any phase of drill rod care or operation — or for prompt deliveries of hollow drill rods in the sizes, types and grades you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

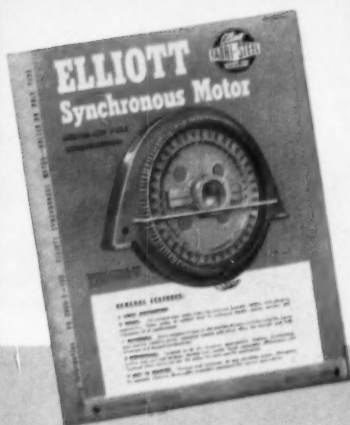
# CRUCIBLE

first name in special purpose steels

## **Crucible Steel Company of America**



Elect ELLIOTT  
synchronous motors  
for your toughest  
compressor drives...



Call the Elliott man  
at your nearby Elliott District Office  
or write Elliott Company,  
Ridgway Division, Ridgway, Pa.  
Ask for Bulletin PB 5000-2

## They're "tailored" to fit your specific application requirements

This Elliott 400-hp, 327-rpm synchronous motor is one of two machines which drives soot blower compressors for a large midwest utility generating station. Here is another example of Elliott-engineered large motors handling "tough" compressor drives *with the greatest economy and long-term, superior performance.*

Two principal reasons for their outstanding performance are the rigid fabricated steel construction, and the high-quality coil insulation. Each coil is hand-wrapped with Mylar-backed mica to withstand severe temperatures and provide long, trouble-free life. What's more, all Elliott synchronous motors are "tailored" *throughout* to meet your exact application requirements.

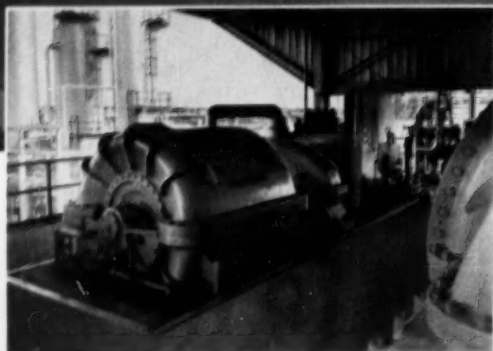
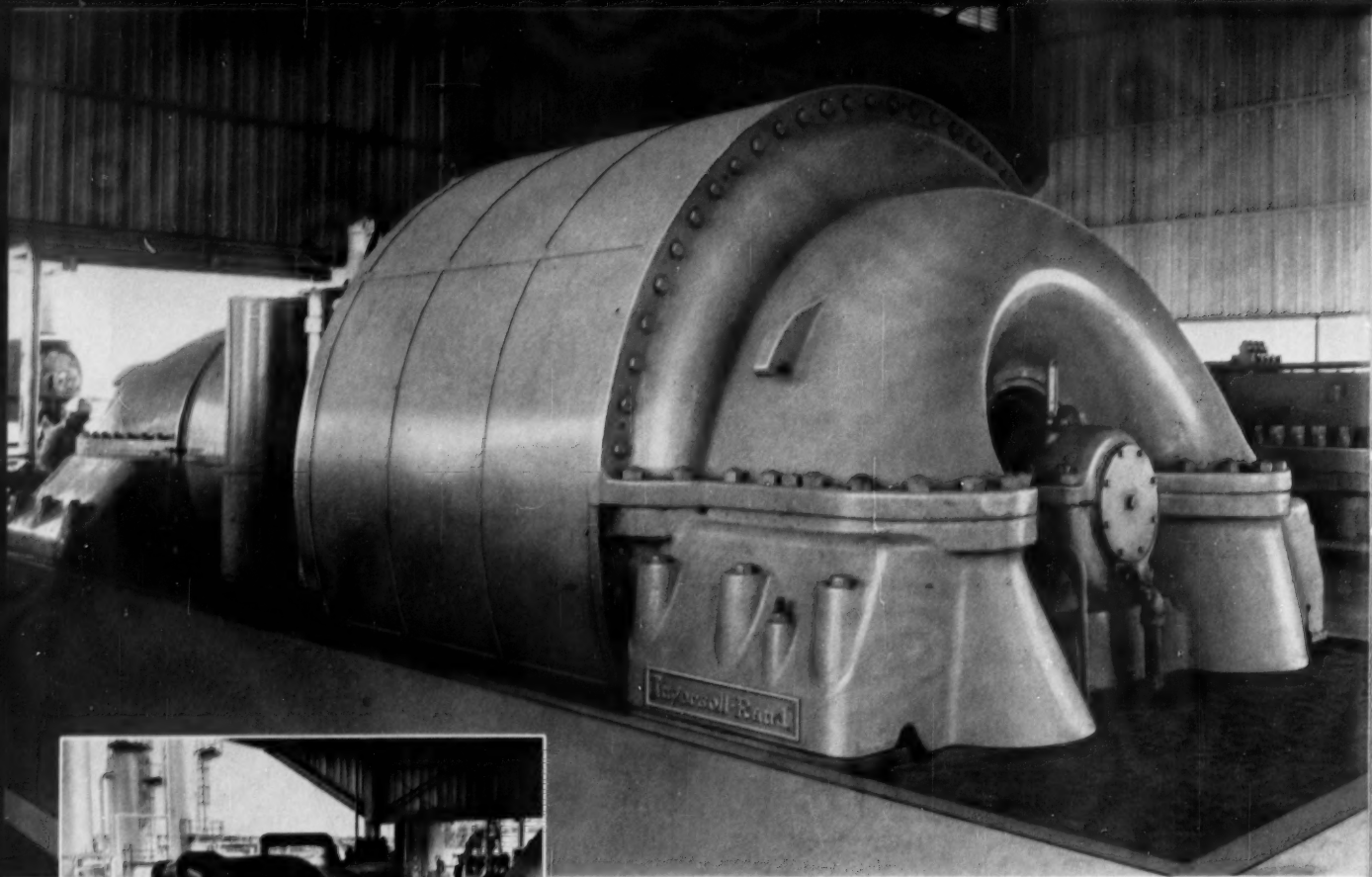
**ELLIOTT Company**

Ridgway Division, Ridgway, Pa.

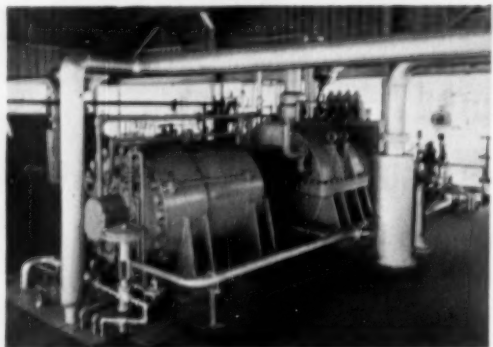


87-23



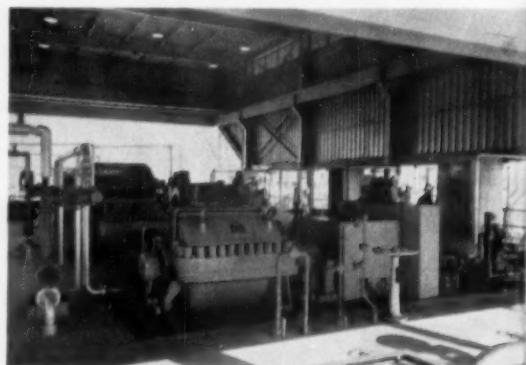


**ORTHOFLOW CRACKER**, the largest cat cracker ever built, is served by this huge I-R Turbo-Blower — a 161,500 cfm unit that discharges at 30 psia. It is the largest cat-cracking air blower in the world and is driven by an I-R 11,250-hp steam turbine. The 3000-hp I-R centrifugal shown at left serves as the carrier or fluidizing compressor on the cracking unit.

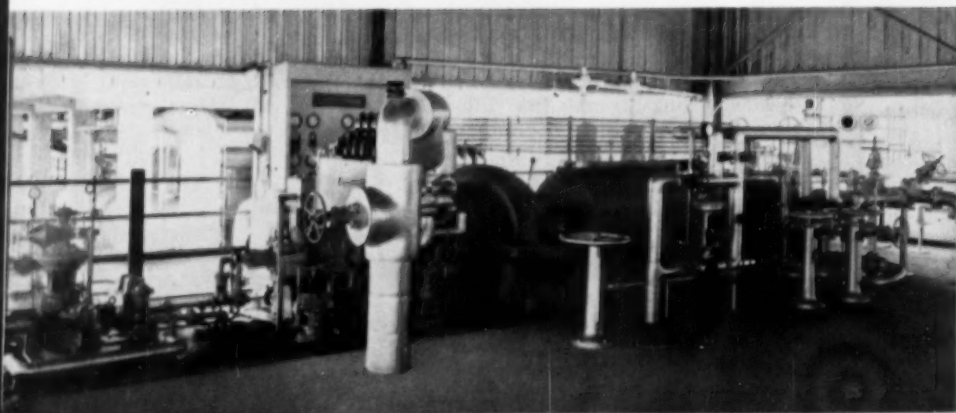


#### HOUDRIFORMER

Two I-R steam-turbine-driven barrel-type centrifugal compressors recycle hydrogen gas. Each unit is rated 5050 cfm at 675 psia discharge pressure.



**GAS PLANT** uses two I-R centrifugals to transfer hydrocarbon gases from the cracker. Operating in parallel, each is rated 15,500 cfm, 200 psia discharge and each is driven by an I-R steam turbine.



**FLUID COKER**, also the world's largest, is served by three Ingersoll-Rand Centrifugals — each driven by an I-R steam turbine. The main air blower, rated at 109,200 cfm at 29 psia is equipped with I-R adjustable inlet guide vanes to permit full-pressure operation down to approximately 30% rated capacity. At the left is one of the two tandem I-R centrifugals that serve as transfer gas compressors. Each is rated 16,100 cfm at 230 psia.

More than 65,000 hp of I-R Compressors serve

# TIDEWATER

## DELAWARE REFINERY

Nineteen Ingersoll-Rand compressors, representing more than 65,000 horsepower, will help the Tidewater Oil Company process 130,000 barrels of oil daily at its new Delaware Refinery south of Wilmington. The refinery is the largest ever built at one time. C. F. Braun & Co. were the engineers and constructors of the huge project which includes several processing units that are the largest of their kind.

The I-R compressors — both *centrifugal and reciprocating units* — will handle a variety of gases for the processing units. Each of the nine centrifugals is driven by an Ingersoll-Rand steam turbine. The re-

ciprocating compressors are electric-motor-driven.

Other Ingersoll-Rand equipment used in the refinery includes ejectors and centrifugal pumps. In the general construction of the refinery, I-R tools and portable compressors were used extensively.

This outstanding installation is further evidence of Ingersoll-Rand's ability to design and build air and gas compressors that best meet the most exacting processing requirements of capacity, pressure, dependability and ease of maintenance. An I-R engineer will be glad to give you complete information on a compressor best suited to your needs.



### Ingersoll-Rand

12-638

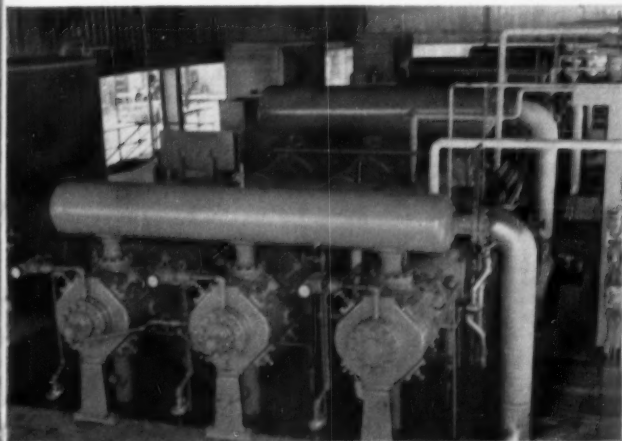
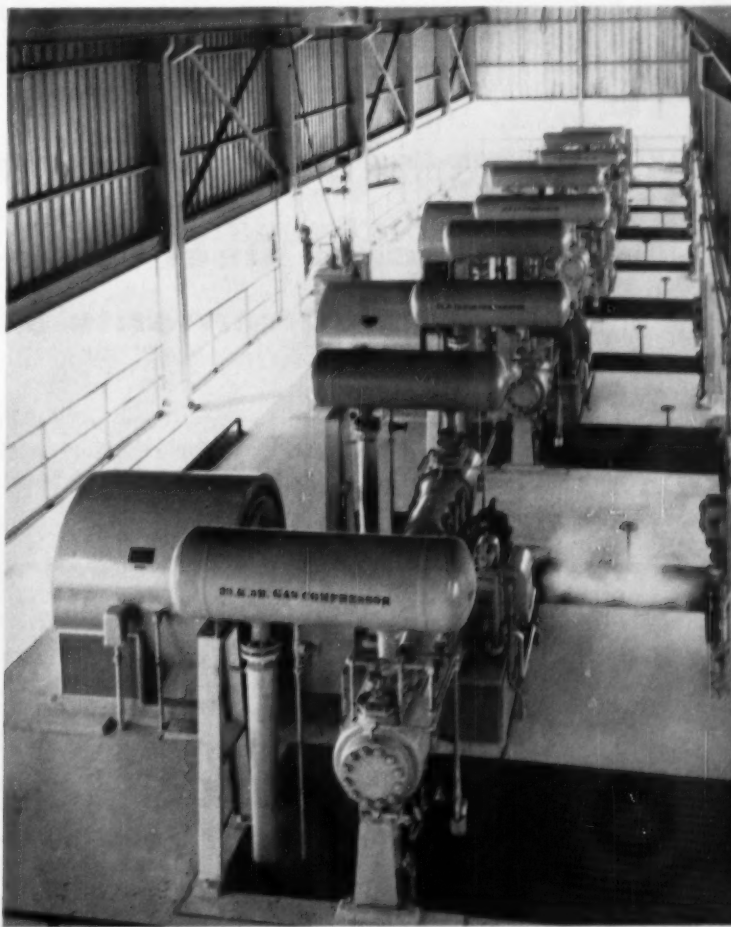
11 Broadway, New York 4, N. Y.

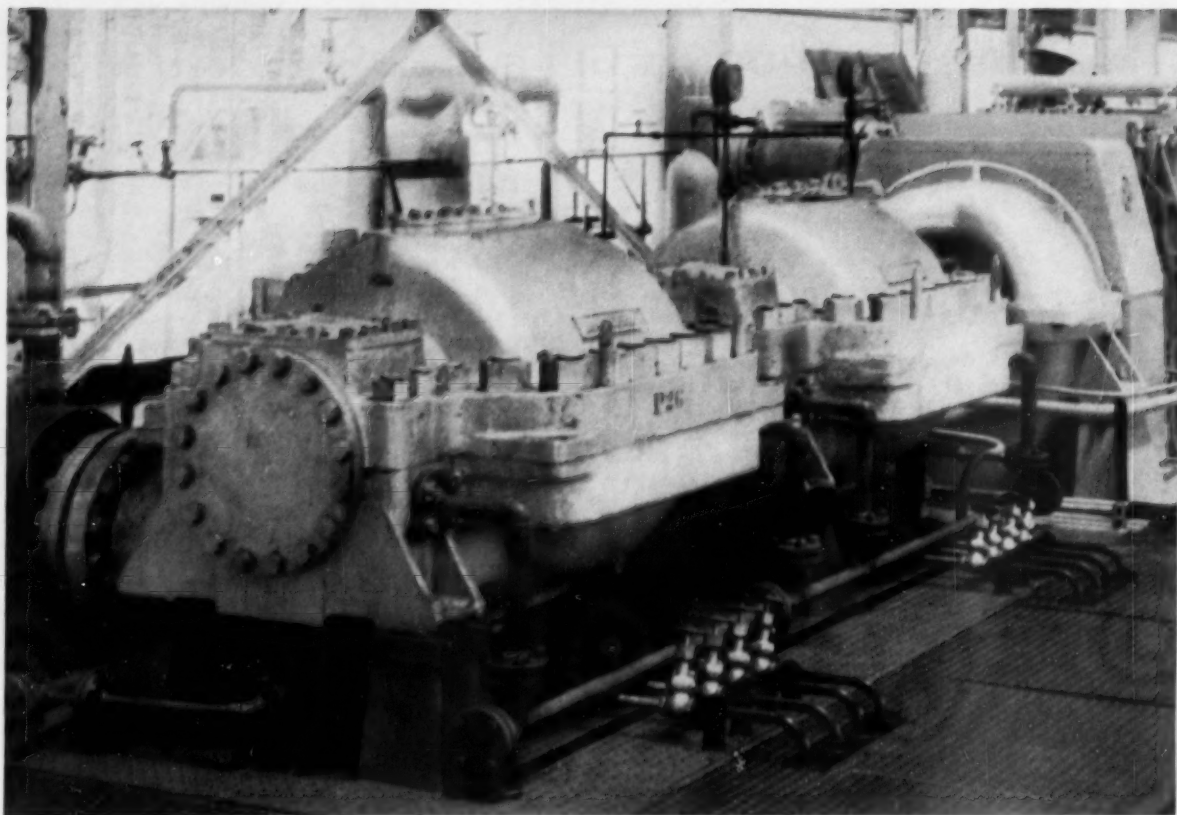
CENTRIFUGAL PUMPS • COMPRESSORS • TURBO-BLOWERS • VACUUM EQUIPMENT • AIR AND ELECTRIC TOOLS • DIESEL AND GAS ENGINES

#### DESULPHURIZATION UNIT

For circulating hydrogen gas in the desulphurization unit six Ingersoll-Rand HHE compressors are used. Two 800-hp units, not shown, have non-lubricated cylinders. An Ingersoll-Rand ES Compressor serves as a recovery compressor.

**HYDROGEN PLANT**—Three Ingersoll-Rand 3000-hp HHE reciprocating compressors serve the hydrogen plant which produces 30,000,000 cubic feet per day of make-up hydrogen used in the reformer and desulphurization units. Each compressor has a capacity of 2,280 cfm.





**Centrifugal Compressors** (shown before lagging) for handling ethylene for cascade refrigeration in separation unit at Port Arthur, Texas, #2 Plant of Gulf

Oil. Housings are cast 3½% nickel steel that exceeds minimum 15 ft.-lb. Charpy impact test requirements at minus 150°F. Built by Ingersoll-Rand, New York, N. Y.

*In Ingersoll-Rand's ethylene refrigeration compressors...*

## **3½% nickel steel casings meet toughness requirements at minus 150°F**

A 3½% nickel steel is vital to these Ingersoll-Rand cascaded compressors used for refrigerating ethylene at Gulf Oil's Port Arthur, Texas, #2 Plant.

The compressors are built to deliver liquefied ethylene after condensation at 270 psi absolute.

In this service, the 3½% nickel steel meets ASTM A 352-52T requirements. It resists em-

brittlement and retains good impact strength right on down to minus 150°F.

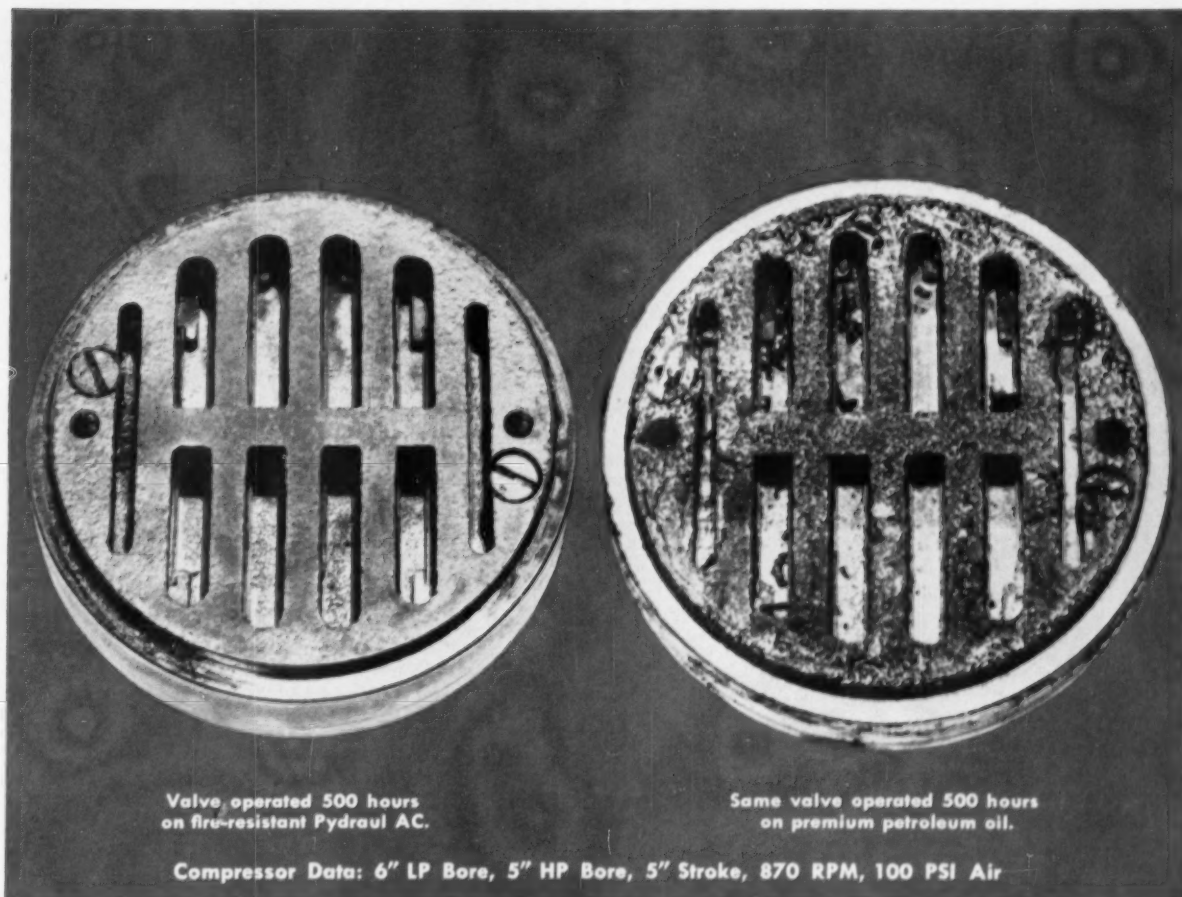
When your customers bring you a temperature problem . . . high or low . . . remember: There's a grade of nickel alloy steel just right for the job. And Inco will be happy to work with you in selecting it. Just write and include the details.

**The INTERNATIONAL NICKEL COMPANY, Inc.**  
67 Wall Street, New York 5, N. Y.



# **INCO NICKEL**





New Pydraul AC lubricant virtually eliminates fire danger two ways—first, by its inherent fire resistance, and second, by keeping air compressor systems free from flammable carbon deposits.

It can actually cut compressor maintenance costs because it runs cleaner, as proved in side-by-side photos of an exhaust valve operated in the same system with only the lubricant changed.

## Photo proof: You reduce fire danger—cut upkeep costs with new **PYDRAUL AC** compressor lubricant


Extensive tests backed by successful field experience throughout industry prove conclusively that Pydraul AC protects against fire and explosion hazards, gives excellent lubricity and can even cut upkeep costs by reducing build-up of carbon deposits within the system.

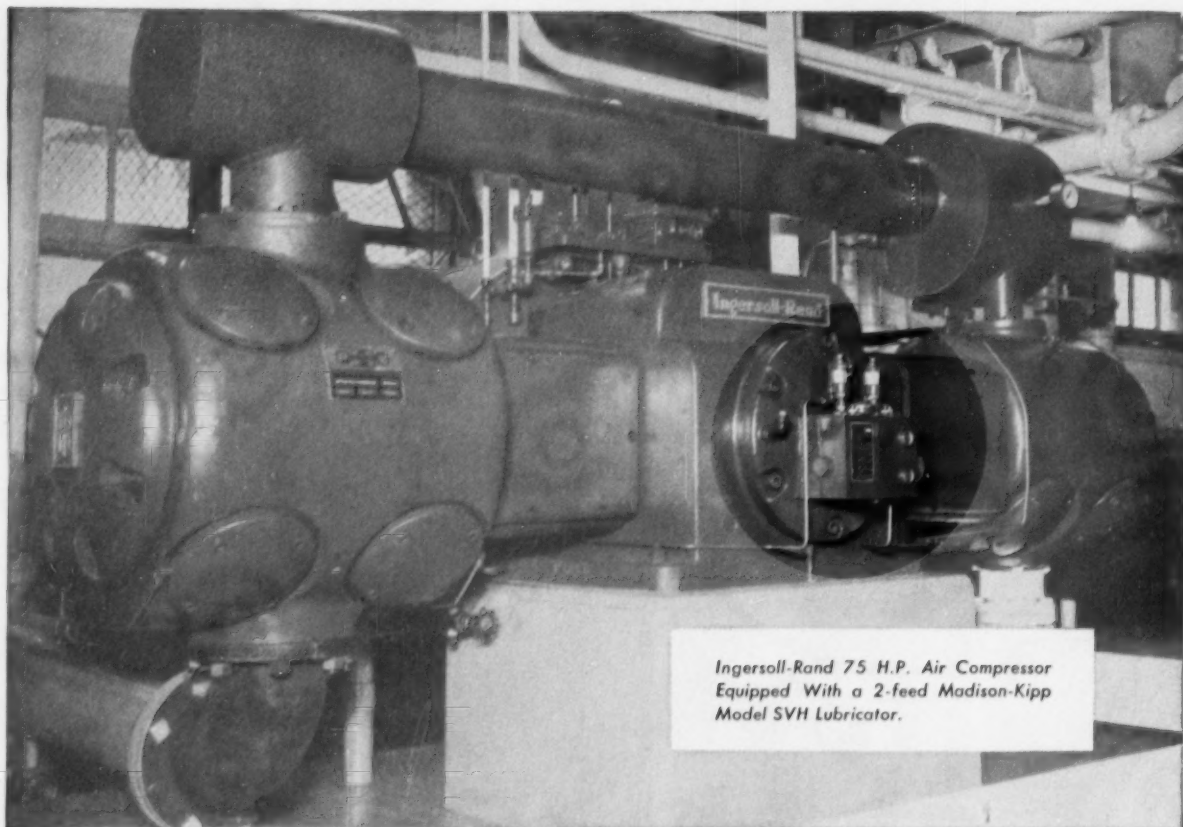
Fire danger lurks in flammable lubricants and their residue deposited in compressed air cylinders and piping. Elim-

inate it now in your compressor, any size, any make. Conversion is easy . . . essentially, just drain your flammable oil and replace with fire-resistant Pydraul AC.

Send this coupon for the "full story" technical bulletin on Pydraul AC. It covers everything you ought to know, including detailed properties and field experience.

*Pydraul: Reg. U. S. Pat. Off.*

	Organic Chemicals Division <b>MONSANTO CHEMICAL COMPANY</b> Functional Fluids Dept., CAM-1 800 N. 12th Blvd. • St. Louis 1, Mo.	
	Please send me the Pydraul AC bulletin.	
	Name.....	Title.....
	Firm.....	
	Address.....	
City.....		State.....



Ingersoll-Rand 75 H.P. Air Compressor  
Equipped With a 2-feed Madison-Kipp  
Model SVH Lubricator.

**Machines of great performance use the most  
dependable oiling system ever developed**

**MADISON-KIPP**

*Fresh Oil*

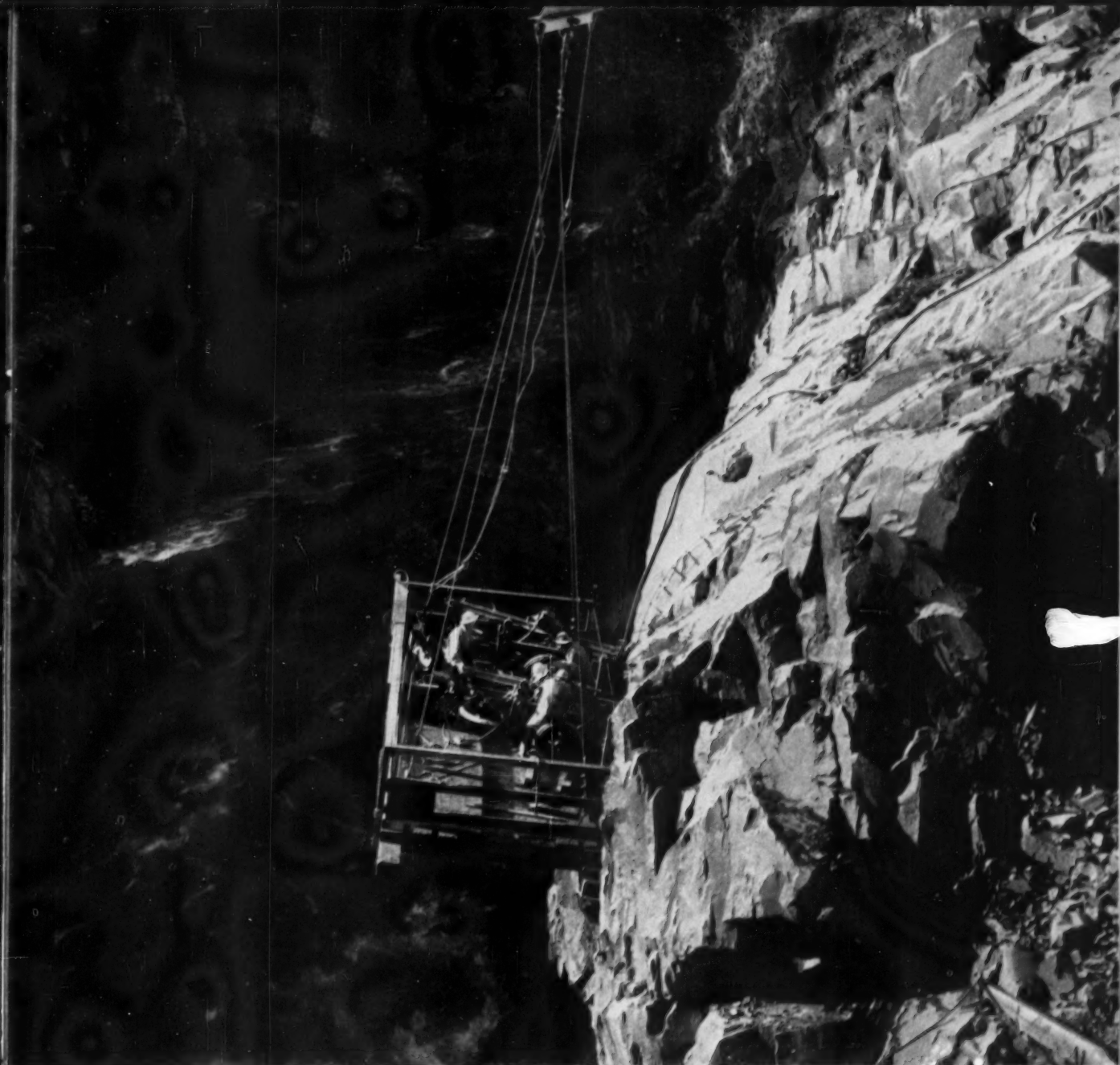
... by the measured drop,  
from a Madison-Kipp Lubricator is the most dependable method of  
lubrication ever developed. It is applied as original  
equipment on America's finest machine tools, work engines  
and compressors. You will definitely increase your  
production potential for years to come by specifying  
Madison-Kipp on all new machines you buy, where oil under  
pressure fed drop by drop can be installed. There are  
6 models to meet almost every installation requirement.



**kipp**

**MADISON-KIPP CORPORATION**  
202 WAUBESA STREET • MADISON 10, WIS., U. S. A.

- Skilled in Die Casting Mechanics
- Experienced in Lubrication Engineering
- Originators of Really High Speed Air Tools



## WIRE ROPE AT WORK

This is a good trick if you can do it, and these four hard-rock men have it mastered. Suspended by means of wire rope above the chattering Cowlitz River, they are shown drilling bolt-holes at the site of the Mayfield Dam in southwest Washington. A project of Tacoma City Light, the

dam will be 850 ft long and 185 ft high when completed.

Wire rope has numerous assignments on any big construction job, though not all of them are as spectacular as the one in the photograph. At the Mayfield Dam project, Bethlehem Purple Strand rope has seen service in many different ways; it has been one of the busiest items of equipment. And as always, Purple Strand has proved itself wholly reliable, day after day, in the heaviest, toughest kinds of lifting and hauling work.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

CONSTRUCTION • EXCAVATING • MINING • QUARRYING • PETROLEUM • LOGGING • MANUFACTURING







This Bucyrus-Erie 770-B walking dragline is mining phosphate matrix near Bartow, Florida. It swings a 20-cu. yd. bucket on a 195-ft. boom.

## Bucyrus-Erie Walking Draglines Move Overburden High, Wide and THEN SOME

Not only do Bucyrus-Erie walking draglines move overburden *high* to the top of spoil piles, but they go down deep for it, too, when necessary. And in addition to moving it high and wide, they traditionally move it *economically*. This ability to move big yardages at consistently low cost has made them preferred for stripping operations everywhere.

Modern front-end design that combines great strength with light weight contributes to outstanding performance—by permitting Bucyrus-Erie walking draglines to swing big

buckets on long booms.

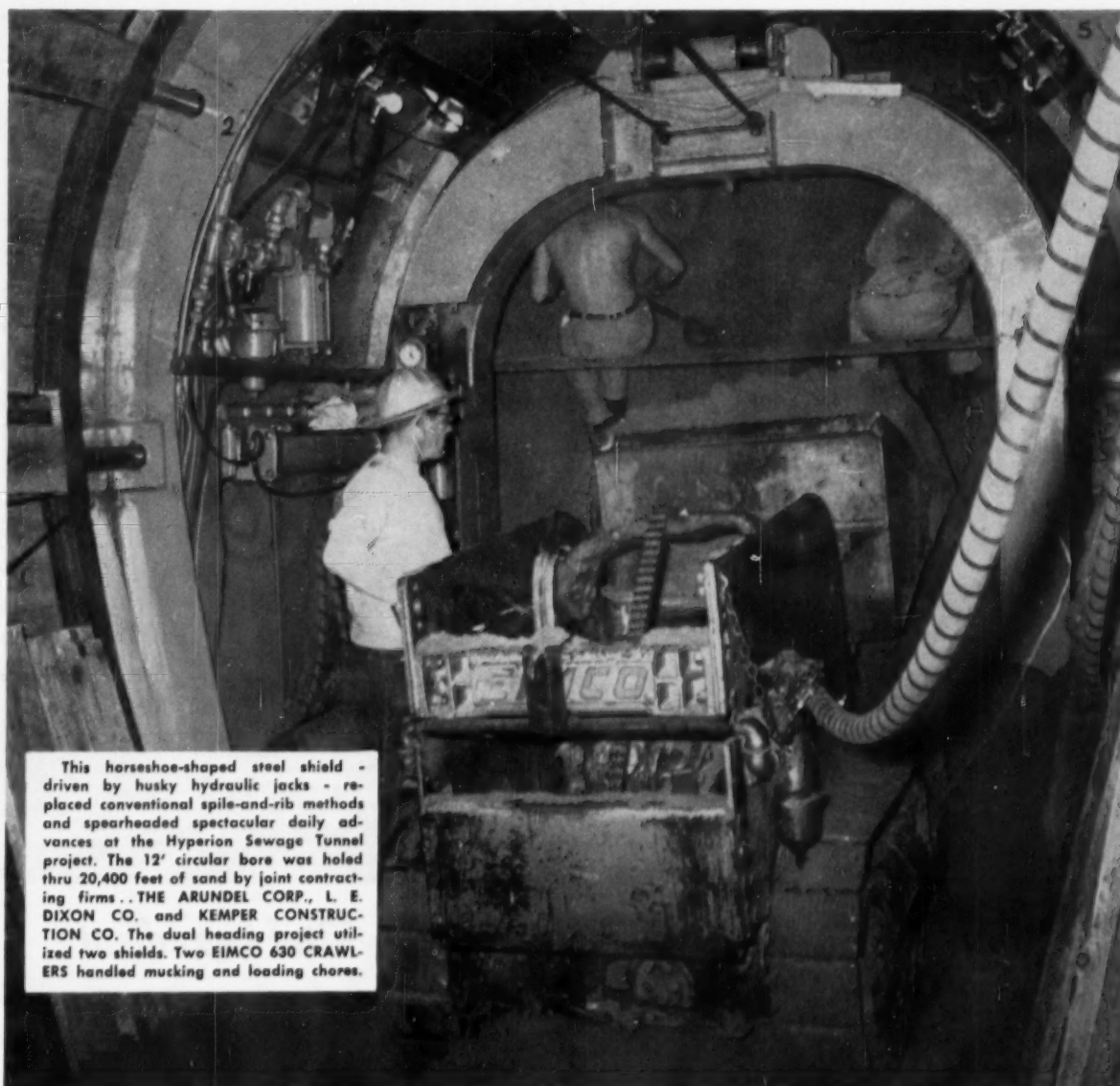
Exclusive Bucyrus-Erie walking mechanism permits smooth, fast moveups, easy maneuvering to most advantageous working position. These features plus month-after-month dependability and low maintenance are your assurance of high volume, economical production.

For moving big yardages economically, choose from the world's largest selection of walking draglines. Contact Bucyrus-Erie Company for full information.

142157

**BUCYRUS  
ERIE**

SOUTH MILWAUKEE, WISCONSIN,



This horseshoe-shaped steel shield - driven by husky hydraulic jacks - replaced conventional splice-and-rib methods and spearheaded spectacular daily advances at the Hyperion Sewage Tunnel project. The 12' circular bore was holed thru 20,400 feet of sand by joint contracting firms... THE ARUNDEL CORP., L. E. DIXON CO. and KEMPER CONSTRUCTION CO. The dual heading project utilized two shields. Two EIMCO 630 CRAWLERS handled mucking and loading chores.

## 'RECORD-BREAKING' TUNNEL DRIVERS USE EIMCO 630'S

LOS ANGELES, CALIF. - Completion of the Hyperion Sewage Tunnel by joint contractors, The Arundel Corporation, L. E. Dixon Company and Kemper Construction Company, had an important impact on the future of two groups: It gives the Los Angeles Citizenry a vital tube thru which additional

sewage from outlying areas will be delivered to the huge Hyperion Treatment Plant... and it introduced to heavy construction industry a much faster driving method for running ground excavation.

Eimco 630 Excavators (one in each heading) were used to handle the loading. The Eimcos cleared

sand from the base of two fast-driving shields... tossing large tonnages over their backs into a 36 in. wide, 110 ft. long lowhead conveyor - which in turn filled 11-4 yd. muck cars.

Write today for full details on the Eimco 630 Excavator.

## THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Pittsburgh, Pa. Seattle, Wash.  
Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa



# UNDERGROUND AIR-LIFT



## *How NAYLOR Pipe Supplies the Vital Ingredient in Tunnel Construction*

Whether you need air for breathing or for operating pneumatic tools in underground construction, there's no better way to supply it than through Naylor Spiralweld pipe.

Because Naylor pipe is light in weight, it's faster and easier to install in tunnel work — especially when joined with the one-piece Naylor Wedgelock coupling.

The exclusive spiral-lock structure provides the extra collapse strength needed for push-pull ventilation. Lines hug the wall and can be made up with only one side of the pipe in the open. They can be extended quickly as work progresses.

Naylor pipe is available in sizes from 4 to 30 inches in diameter and thicknesses from 14 to 8 gauge.

For full details, write for Bulletins No. 507 and No. 514.

# NAYLOR

**NAYLOR PIPE COMPANY**

1245 East 92nd Street, Chicago 19, Illinois



**Eastern U.S. and Foreign Sales Office:**

60 East 42nd Street, New York 17, N. Y.





When your spotting system is arranged to take full advantage of the Eimco 105 Excavator's ability to complete a cycle without turning... its loading capacity per \$ of investment and maintenance can exceed that of conventional loaders or boom shovels by as much as 400%.

## EIMCO 105 TRACTOR MOBILITY GETS EXTRA CAPACITY

Power shifting... operating simplicity... independent track reversal... forward operating position... low center of gravity...

are five important reasons why the Eimco 105 Tractor gets "extra" performance from its overhead or front-end loaders.

Eimco Unidrive, power-shift transmission combined with torque converter fluid drive, saves seconds every cycle and eliminates downtime due to burned facings or other clutch troubles. Without taking your left hand from the wheel, you simply manipulate power-shift levers for high, low, forward, reverse while the tractor is moving under full load. There's no reaching, no gear clash, no hesitation.

Independent track reversal is especially advantageous in front-end loading. It permits this 105 to pivot sharply from the muck pile and get material into trucks faster. It gets either loader out of trouble quickly... a big factor on hazard-

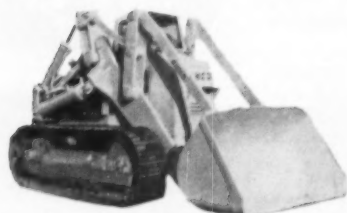
dous jobs.

A 105 operator is always "on top of his work". Without standing or "craning" his neck, he can see to attack the muck pile at the best spot for fast loading. This, combined with operating ease, greatly reduces fatigue... gets greater man-hour efficiency.

Low center of gravity gives the 105 tractor extra stability... permits it to traverse 100% grades without tipping.

This combination of extreme tractor mobility and one of two high utility loaders, gives you a wide choice in adapting an earth-moving technique most profitable for your job requirements.

An Eimco Sales Engineer will help you decide which model fits into your job scheme most profitably.



**EIMCO 105 FRONT-END LOADER**  
2½ yard... 40,000 lb. break-out



**EIMCO 105 EXCAVATOR**  
1½ yard... Overhead discharge

## THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A.

• Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y.  
Cleveland, Ohio

Chicago, Ill.  
Houston, Tex.

San Francisco, Calif.  
London, England

El Paso, Tex.  
Gateshead, England

Birmingham, Ala.  
Duluth, Minn.

Paris, France

Kellogg, Ida.  
Milan, Italy

Pittsburgh, Pa.  
Seattle, Wash.  
Johannesburg, South Africa



B 276

## DISTRICT OFFICES

**BOSTON, MASS.**  
354 Washington St.,  
Wellesley Hills, Mass.  
Phone Wellesley 6-6868

**BUFFALO 21, N.Y.**  
P.O. Box 77  
Phone Plaza 5820

**CHICAGO 14, ILL.**  
2701 N. Paulina Street  
Phone Eastgate 7-6450

**CINCINNATI 12, OHIO**  
2089 Sherman Ave., Room 53  
Phone Jefferson 1-2855

**CLEVELAND 14, OHIO**  
NBC Bldg. 815 Superior Ave., N.E.  
Phone Cherry 1-0862

**DAVENPORT, IOWA**  
705 Union Arcade Bldg.  
Phone 6-3133

**DETROIT 35, MICHIGAN**  
18228 James Couzens Hwy.  
Phone University 2-5917

**ERIE, PENNSYLVANIA**  
12th & Cranberry Streets  
Phone 2-6436

**GRAND RAPIDS, MICH.**  
The Jay Company  
3251 Lake Michigan Drive, N.W.  
Phone Glendale 6-8391

**HOUSTON 4, TEXAS**  
P. O. Box 8188  
4101 San Jacinto  
Phone JA 3-5701

**INDIANAPOLIS 18, IND.**  
1701 N. Sherman Drive  
P. O. Box 7181  
Phone Fleetwood 7-1127, 7-1128

**KANSAS CITY 10, MISSOURI**  
1102 E. 47th Street  
Phone Valentine 1-0100

**LANCASTER, PA.**  
Clair M. Williamson Associates  
P. O. Box 531  
139 Nevin Street  
Phone Express 4-1546

**LOS ANGELES 22, CALIF.**  
Westco Pump Sales Co.  
4621 Sheila Street  
Phone Angelus 2-1155

**MILWAUKEE 11, WIS.**  
316 E. Silver Spring Drive  
Phone Woodruff 2-7500, 2-7501

**MINNEAPOLIS 4, MINN.**  
The Edey Company  
1302 Fifth Ave., South  
Phone Federal 3-2813

**NEWARK 4, NEW JERSEY**  
1245 McCarter Highway  
Phone Humboldt 2-9233, 2-9234

**PHILADELPHIA 40, PA.**  
124 S. Easton Rd., Glenside, Pa.  
Phone Turner 4-4668

**PITTSBURGH 12, PA.**  
516 Federal Street  
North Side Deposit Bank Bldg.  
Phone Fairfax 1-4486

**SAN FRANCISCO 24, CALIF.**  
Westco Pump Sales Co.  
85 Industrial Street  
Phone Valencia 6-5104, 6-5107

**SEATTLE 16, WASH.**  
H. S. Emanuels  
4015 Prince Street  
Phone West 8700

**SKANEATELES, N. Y.**  
P. O. Box 216  
Phone 1093

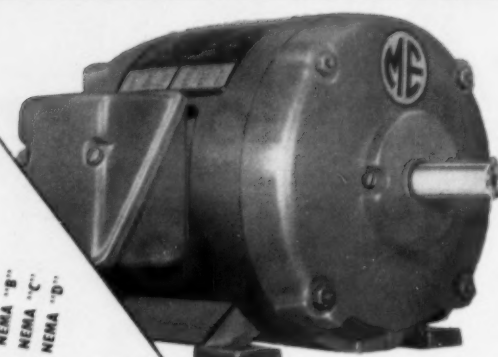
**TULSA 3, OKLA.**  
Bekin Bldg., 20 E. Archer Street  
Phone Gibson 7-0520

**WAUSAU, WISCONSIN**  
(Home Office)  
Randolph & Cherry Streets  
P. O. Box 630  
Phone 2-2011 thru 2-2015  
EXPORT DEPARTMENT  
Marathon Electric Mfg. Corp.  
431 Fifth Ave.  
New York 16, New York  
Phone Murray Hill 5-3522

Call Any Of The  
Above Offices For  
Complete Information

MARATHON  ELECTRIC  
MOTORS — GENERATORS

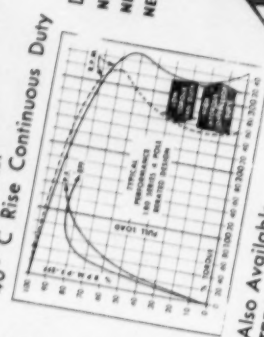
4 in 1  
INTEGRAL HP  
MOTORS



MARATHON  ELECTRIC

Specifications:  
40° C Rise Continuous Duty

Designs:  
NEMA "B"  
NEMA "C"  
NEMA "D"



Also Available  
TEFC — TENV — and  
Explosion Proof

New NEMA Frames 182 thru 326U

It's  
✓ Splash-proof  
✓ Drip-proof  
✓ Guarded  
✓ Weather Protected

- EXPERIENCE . . . PROVEN PERFORMANCE.  
There is no substitute for the reliability of proven performance . . . Top Names of the Nation's Industry have proven  performance in PRODUCING QUALITY PRODUCTS.
- VERSATILITY . . . WIDE RANGE OF DESIGN.  
Single Phase . . . Polyphase . . . Direct Current NEMA Standard . . . or Special Design  can design to meet your special specifications.
- SERVICE . . . THROUGHOUT the NATION.  
There is an  District Office near you . . . Call our Sales Engineer TODAY to help solve your motor problem.

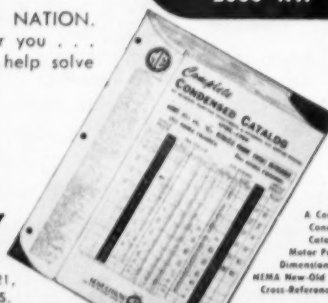
**MOTORS**  
1/20 HP thru  
2500 HP

**GENERATORS**  
1/2 KW thru  
2000 KW



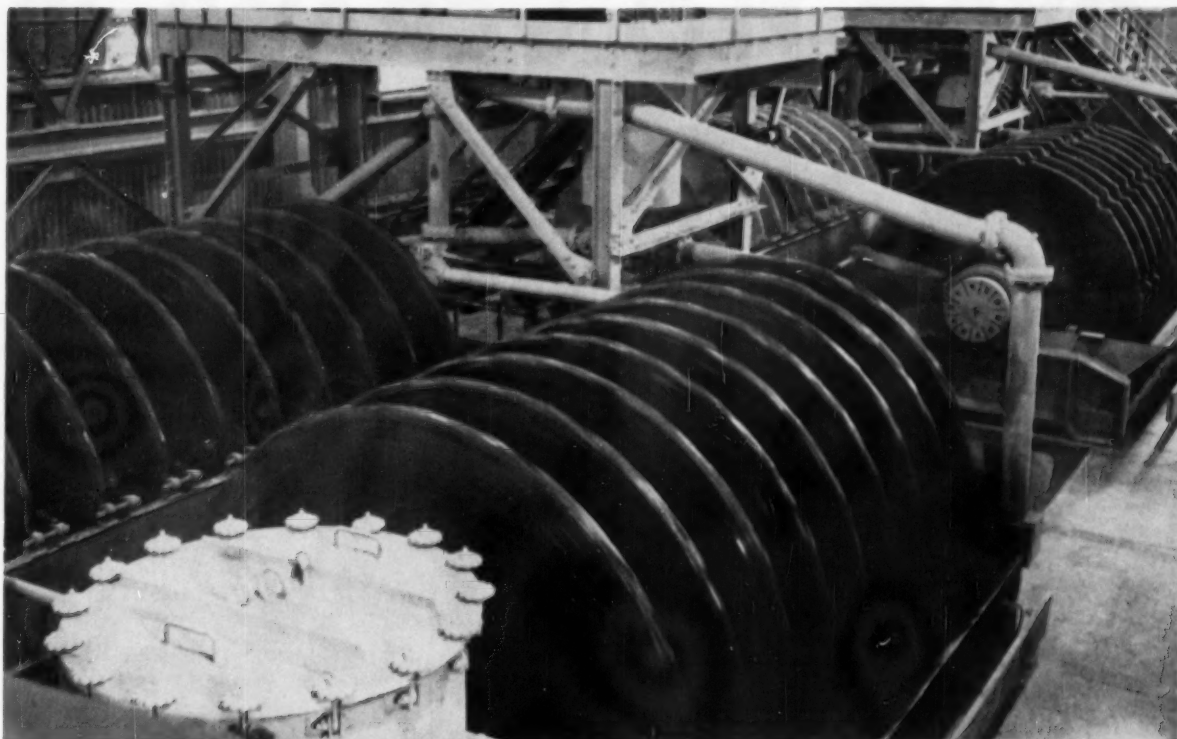
*Yours  
for the  
Asking*

WRITE DEPT. 21,  
WAUSAU, WIS.



A Complete  
Condensed  
Catalog of  
Motor Prices &  
Dimensions with  
NEMA New-Old Frame  
Cross-Reference List.

SINCE 1913  
**MARATHON  ELECTRIC**  
HOME OFFICE AND FACTORY, WAUSAU, WIS. FACTORIES AT ERIE, PA. AND EARLVILLE, ILL.  
SALES OFFICES IN PRINCIPAL CITIES



FOR UNIVERSAL ATLAS CEMENT CO.

## Eimcos SAVE fuel - INCREASE Kiln CAPACITY

**Universal Atlas Cement Company** is one of America's few producers of **white** portland cement and is a major manufacturer of **gray** portland cement.

Since 1943 — when their modern 4-kiln **Northampton, Pa.** plant (1 white portland cement kiln and 3 gray portland cement kilns) began operating — **8 Eimco Disc Filters** (two over each kiln) have been getting economic advantages expected of the filtration cycle in a wet process cement flowsheet.

Ground limestone-white slurry for the white

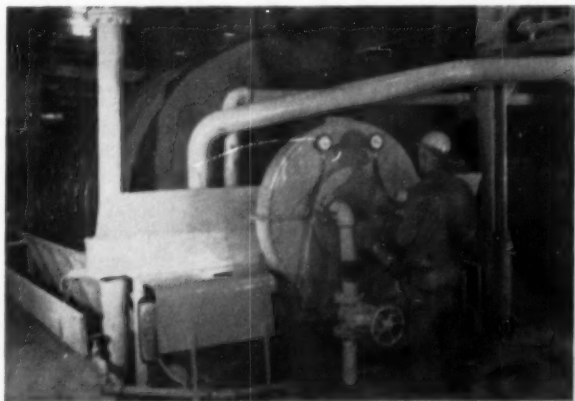
portland cement kiln has a 40% moisture content before filtration. Cakes produced on the Eimcos contain about 22% moisture. Each 8' 10" x 6 disc Eimco Filter has handled peak loads at a rate of **400** tons of white dry solids per 24 hour day... 53.4 lbs. per sq. ft per hour

Ground raw material for the gray kilns has a moisture content of 41% before filtration. Eimco cakes contain about 23% moisture. Each 8' 10" x 9 disc Eimco Filter can handle peak loads at a rate of **700** tons of gray dry solids per 24 hour day... 62.4 lbs. per sq. ft. per hr.

This moisture reduction cuts BTU drying requirements and decreases kiln fuel costs. **Universal Atlas Cement plant** officials estimate kiln capacity is increased very materially thru Eimco Disc Filtration.

Initially, the plant experienced production slow-downs from filter media deficiencies. Thru extensive testing, Eimco was able to help this client select the media most advantageous to his operation... with substantial savings in media costs. Feed to each kiln now is mainly supplied by one filter which permits maintenance work on the other with no production shutdown... a factor that minimizes maintenance costs.

Write for details concerning this and other Eimco Filters.



**THE EIMCO CORPORATION**  
SALT LAKE CITY, UTAH

Research and Development Division, Palatine, Illinois

Export Offices: Eimco Building, 51-52 South Street, New York 5, N. Y.

BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Process Engineers Inc. Division, San Mateo, California



B 275



# GYRO-FLO + CRAWL-IR



*... a highway construction team  
that gives you completely  
mechanized drilling power  
at its **RUGGED BEST!***



**T**HE new Ingersoll-Rand CRAWL-IR is the most completely mechanized, self-propelled crawler drill ever developed. Boom swing, boom lift, tower tilt, tower swing and tower lift are all hydraulically controlled at the touch of a throttle, permitting faster, easier and safer setups for drilling in any position. And because it tows its own air compressor, even up grades and over rough terrain, you don't have to take other equipment off the job for this purpose.

Teamed up with a Gyro-Flo 600-cfm, it gives you a drilling combination that has no equal for economy and dependability of operation. The famous Gyro-Flo rotary action, thoroughly proved by more than six years of on-the-job service, is your best assurance of low-cost, virtually maintenance-free air power. Ask your IR Distributor or representative for complete information on this pace-setting drilling team.

## Ingersoll-Rand

11 Broadway, New York 4, N. Y.

14-612

THE BEST AIR EQUIPMENT FOR BETTER HIGHWAYS

## ON THE COVER

**C**OAST Guard maintenance crews travel the east coast of the country throughout the year, seeing to the upkeep of Uncle Sam's considerable investment in lighthouses. Our cover picture shows one of the crews sandblasting a lighthouse at Pemaquid Point, Maine, near Booth Bay Harbor about 30 miles from Portland.

## IN THIS ISSUE

**F**OR A PRODUCT that once was wasted, natural gas has achieved great recognition as a fine fuel. Great pipelines interconnect producing areas with more densely populated parts of the country, bringing the gas to market. Even the old bug-a-boo of "too much in summer, not enough in winter," has been solved by providing storage facilities near major consumer centers. Our lead article tells of a reclaimed field being used for that purpose and describes some of the equipment at a 20,000-hp compressor station that pumps gas into and out of the storage formation.

**N**OW THAT the saga of steam railroading is over, many nostalgic individuals bemoan the passing of the great steam locomotives. Cost accountants at railroads don't however, because modern diesel-electrics are more efficient and require less maintenance. Recently the first commercially successful American diesel-electric locomotive was retired. For an account of the proceedings and a description of Old No. 1000, turn to page 229.

**F**OR COUNTLESS generations the rivers of the Missouri and Mississippi basins have surged out of their banks each spring. The cost of the annual incursions on nearby farm lands and into riverside communities has been incalculable. One job on the list of projects being undertaken to control the normally placid streams is the Coralville Dam on the Iowa River. An account of some of the work taking place there starts on page 232.

**E**STABLISHING scientific bases in the Antarctica posed a number of problems to the men and machines assigned to the task. *Operation Deep Freeze* is described in an article beginning on page 235.

# Compressed Air Magazine

© COMPRESSED AIR MAGAZINE COMPANY 1957

VOLUME 62

August 1957

NUMBER 8

G. W. MORRISON, *Publisher*

R. J. NEMMERS, *Editor* R. W. SAFORA, *Manager*  
S. M. PARKHILL, *Assistant Editor* ELMER G. ANDREWS, *Advertising Mgr.*  
J. W. YOUNG, *Advertising Director* FRANCIS HARTMAN, *Circulation Mgr.*  
J. J. KATARBA, *Business Mgr.*  
D. Y. MARSHALL, *Europe*, 243 Upper Thames St., London, E. C. 4.  
F. A. McLEAN, *Canada*, New Birks Building, Montreal, Quebec.

## EDITORIAL CONTENTS

Winter Gas Supply for Detroit—R. J. Nemmers	224
No. 1000 to Hall of Fame—S. M. Parkhill	229
Flood Control on the Iowa River—Harold Stickler	232
Operation Deep Freeze	235
Air Speeds Plumbing Contracts—Morris P. Rosen	239
Aluminum Jacketing Protects Steam Pipelines	240
Air-Jet Inspirator	241
Peruvian Portraits	242
Editorials—Sidewalk Supers Open Job—Moneyless Journey—	
More About Elements	243
Texas Eastern Reconverts Little Big Inch Pipeline	244
Engineering Cooperation Between the Centuries	245
Saving With Air Power	245
This and That	246
Industrial Notes	249
Briefs	252
Industrial Books, Films and Literature	254

## ADVERTISING CONTENTS

Adams Co., Inc. R. P.	19, 22	Madison-Kipp Corporation	10
American Air Filter Co., Inc.	21	Marathon Electric	16
Armstrong Machine Works	32	Maxim Silencer Co., The	20
Bethlehem Steel Company	11	Monsanto Chemical Company	9
Blaw-Knox Company	34	National Forge & Ordnance Co.	26
Bucyrus-Erie Company	12	Naylor Pipe Company	14
Combustion Engineering	30	New Jersey Meter Company	33
Conrader Co., Inc. R.	34	Niagara Blower Company	28
Continental Motors Corporation	27	Punch-Lok Company	32
Crucible Steel Co. of America	4	Schrader's Sons, A.	31
Dollinger Corporation	3	Tapecoat Company	32
Eimco Corporation, The	13, 15, 17	Texas Company, The	2nd Cover
Elliott Company	5	Timken Roller Bearing Co.	Back Cover
Goodall Rubber Company	24		
Ingersoll-Rand Company	6, 7, 18, 23, 33, 3rd Cover	Waldron Corp., John	25
International Nickel Co., The	8	Walworth Company	29
		Wood's Sons Co., T. B.	33

A monthly publication devoted to the many fields of endeavor in which compressed air serves useful purposes. Founded in 1896.

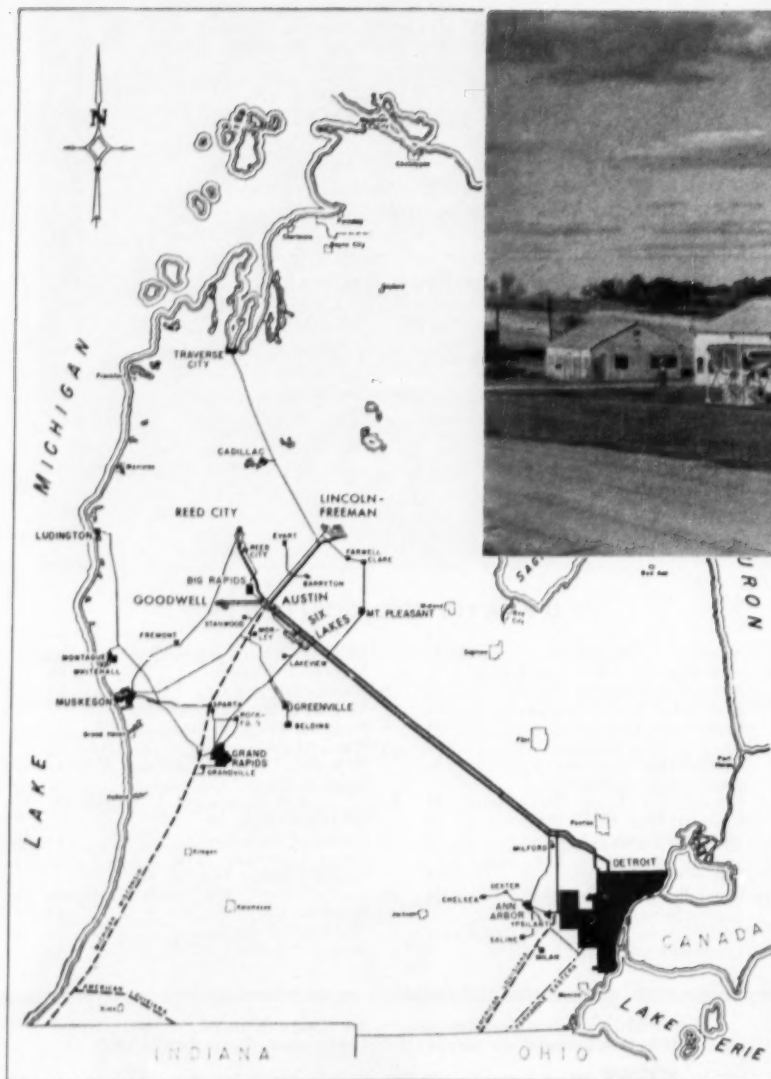
**BPA** Member Business Publications Audit of Circulation, Inc.

Published by Compressed Air Magazine Co., G. W. MORRISON, *President*  
C. H. VIVIAN, *Vice-President* A. W. LOOMIS, *Vice-President*  
J. W. YOUNG, *Secretary-Treasurer*  
Editorial, advertising, and publication offices, Phillipsburg, N. J.  
New York City Office, 11 Broadway, L. H. GEYER, *Representative*  
Annual subscription: U.S., \$3.00, foreign, \$3.50. Single copies, 35 cents.  
COMPRESSED AIR MAGAZINE is on file in many libraries and is indexed in Industrial Arts Index and in Engineering Index.

## WINTER GAS SUPPLY FOR DETROIT

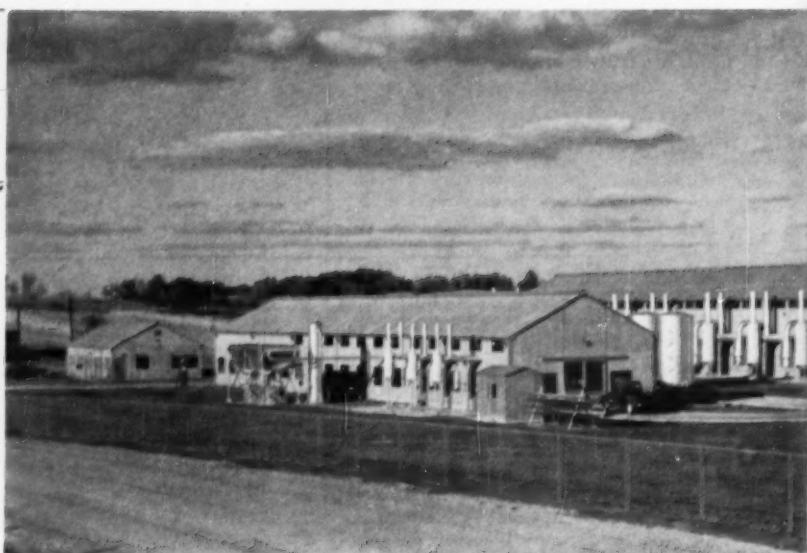
A 20,000-hp, 11-Machine Compressor Station Provides  
Many Control Steps To Meet Widely Varying Demands

R. J. Nemmers



LOCATION MAP

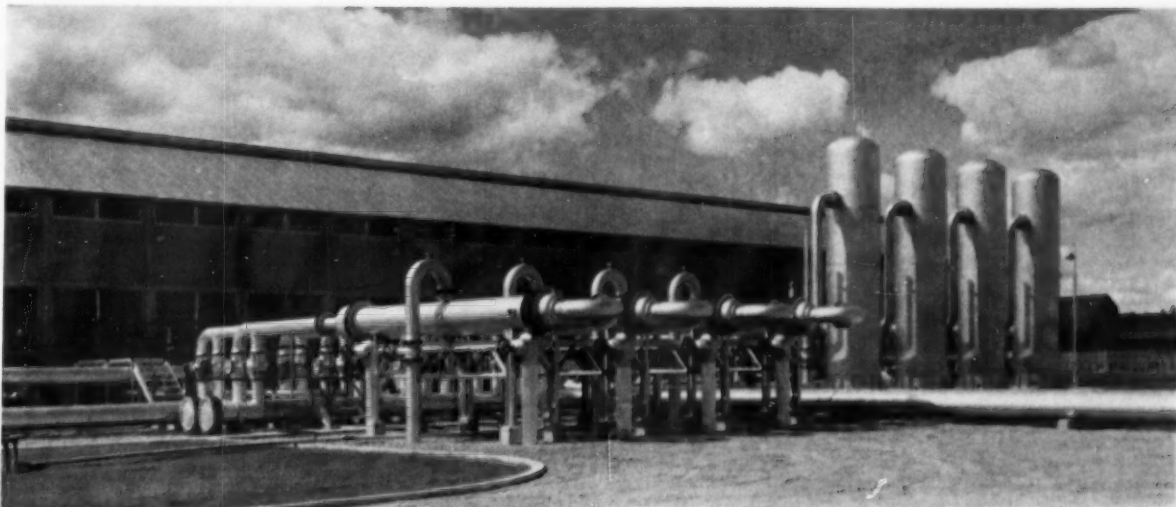
This sketch of the State of Michigan shows the relationship of Six Lakes Station to the rest of the Michigan Consolidated network and its supplier pipelines. Panhandle Eastern runs 22- and 26-inch lines into the state; Michigan Wisconsin, feeding the western and central sections of the state, has a 22-inch line; and American Louisiana has a 30-inch artery. Two 24-inch lines carry summer gas surpluses to Six Lakes, returning the gas to Detroit in winter. Just above Six Lakes Station, another large compressor plant, William G. Woolfolk Station, handles storage duties in the Austin, Goodwell, Lincoln-Freeman and Reed City fields.



**W**INTER in the Detroit area can be pleasant. Situated between lakes Erie and Huron, snow falls on the city and its environs each of the winter months, and the surrounding area abounds with winter sports. In the metropolis itself, salted slushy streets detract from the popular concept of a "winter wonderland," but no more than in other major cities. Fifth largest of United States metropolitan areas, winter in the city of automobiles has long given headaches to Michigan Consolidated Gas Company, the utility that supplies natural gas to its thousands of homes and to most of its giant industries. Being far from centers of fuel production, the city has come to rely extensively on gas, not only for heat, but to fuel its industries as well. When winter comes to Detroit, the gas demand soars.

Three pipelines supply the utility: Panhandle Eastern Pipe Line Company, delivering 46 billion cubic feet per year; Michigan Wisconsin Pipe Line Company, supplying 66 billion cubic feet annually; and American Louisiana Pipe Line Company, furnishing 73 billion





#### SIX LAKES STATION

The physical layout of Michigan Consolidated's compressor plant is shown in the illustration at the left. At the far left is the office. Immediately next to it is the power building, housing three Ingersoll-Rand gas-engine-generator sets having a total of 1224 hp. On the road side of the building can be seen the fan-cooled heat exchangers that serve the engine generator sets. Also housed in the building are two I-R 250-psi starting air compressors. Two I-RES single-stage units that handle recycle gas for regeneration of dehydrators are in a third building, not shown. The gas-engine-driven compressors are in the building in the center. All the engines are served by Burgess Manning exhaust snubbers and American Air Filter intake filters. The small buildings in the background house part of the dehydrator and regeneration equipment including recycle gas heaters. The metal buildings have double-shell sandwich-type walls with a 1-inch-thick filler of rock-wool insulation. Shown above is some of the maze of piping serving the facility. The horizontal "tanks" in the foreground are the gas after-coolers. Water cross-flows gas in these units: the gas flowing through tubes and the water circulating in the shell. The vertical tanks at the right are scrubbers.



cubic feet each year. The gas is delivered to approximately 835,000 customers in more than 110 cities, villages and townships with populations totalling, in the 1950 census, approximately 2,900,000. The major sections in which natural gas is distributed are the important industrial areas of Detroit, Grand Rapids and Muskegon; the communities of Ann Arbor and Ypsilanti, adjacent to the Detroit metropolitan area; the central Michigan cities of Mt. Pleasant, Greenville, Belding, Big Rapids and Cadillac; and the northern lake ports of Ludington and Traverse City.

As is the case with almost all natural gas utilities, Michigan Consolidated is faced with the condition of having a virtually unvarying daily supply coming into the pipelines that furnish it with gas, and on the other hand, of having a greatly fluctuating seasonal demand on the other end of the line. Further, the capacity of the lines feeding the system is not great enough to handle the peak-load requirements, although plenty of extra gas is available in slack months.

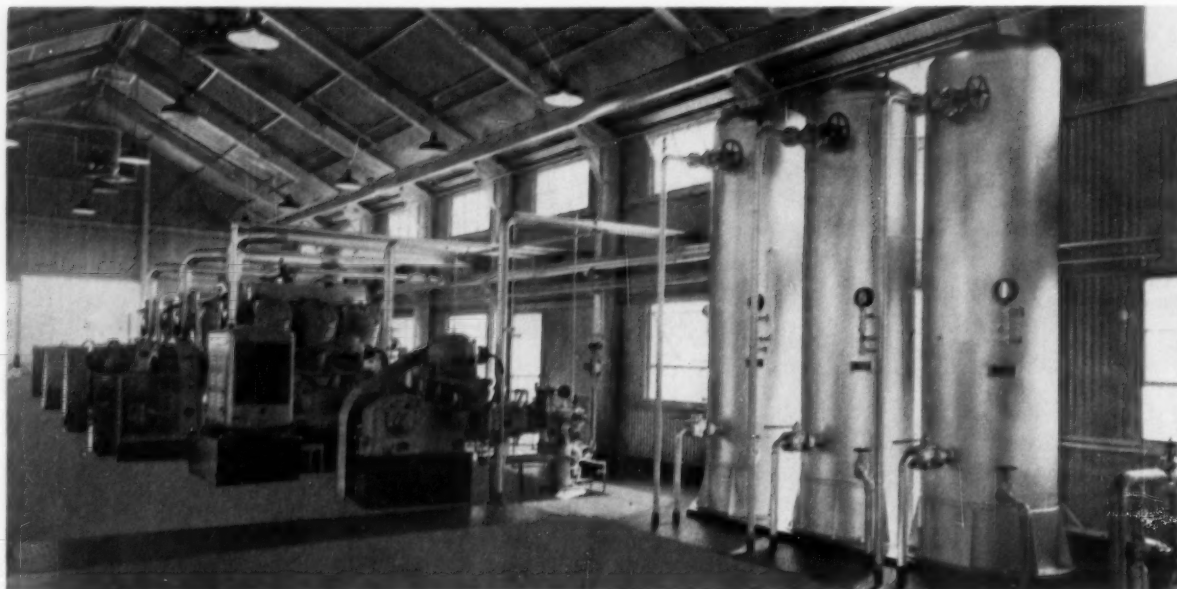
This condition has led the Company

to develop depleted natural gas fields in the central part of the state for underground storage. They are located within a 50-mile radius of Big Rapids, Mich., and the first to be developed were Austin, Reed City, Goodwell and Lincoln-Freeman. The latter were developed in conjunction with a supply of natural gas from the Panhandle-Hugoton Area transported by the Michigan Wisconsin Pipe Line Company.

The most recent field to be developed for underground storage is the Six Lakes Field. It lies approximately 50 miles northeast of Grand Rapids, Mich., in the same general area as the original four and was developed in conjunction with an additional supply of natural gas from the Gulf Coast brought in by the American Louisiana Pipe Line Company. The Six Lakes Field is about 115 miles northwest of Detroit and was originally developed in the middle and late 1930's as a natural-gas-producing field. It is located in a Michigan stray sandstone formation. Approximately 200 wells were drilled in this field at that time.

In 1950, Michigan Consolidated obtained control of the field at which time it was producing gas in very limited quantities. Rehabilitation work started in 1953, at which time all the usable wells were reconditioned, others were plugged permanently, and additional wells were drilled. The field now has 171 wells through which gas may be injected or withdrawn. The field itself has a surface area of approximately 20,000 acres and is approximately 10 1/2 miles long and 1/2 mile wide. The long extremity of the field lies in a northwest-southeast direction as do all Michigan stray sandstone gas fields found in the state. The formation is located approximately 1300 feet below the surface and varies in thickness from 30 to 60 feet.

Each of the original wells, many of which were covered over, had to be found and tested in order to determine whether or not they were usable. In the wells to be reconditioned it was necessary to remove all the material that had fallen or been dumped into them during previous plugging operations. A new 5-inch diameter casing was placed



#### STARTING AIR COMPRESSORS

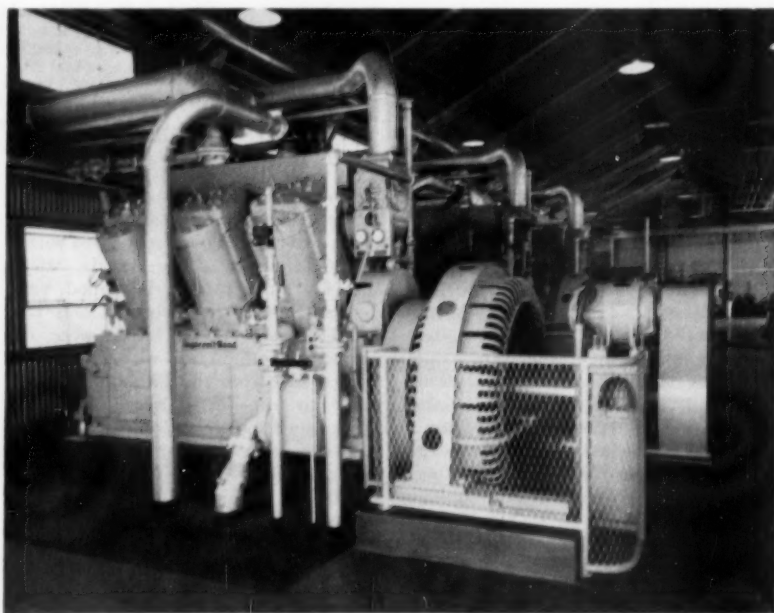
Supplying air to start the eleven gas-engine-driven compressors and three generator sets, the two Ingersoll-Rand ES-2 machines shown in this view (above) discharge at 250 psi. The air is stored in the three large receivers shown in the foreground. In addition to its starting chores, air is used to operate and control the station's emergency shutdown system. The units normally are driven by 30-hp electric motors, but one is equipped with an alternate-drive Continental Red Seal B-371 engine so that starting air can be compressed even if the station is completely shut down. No external source of power is provided—the station is entirely self-sufficient.

inside the old 8-inch casing and cemented in place. That was done by lowering the 5-inch casing into the well and hydraulically forcing cement through it, around its lower edge, and back up into the space between the old and new casings, until it appeared at the surface. Cable drilling tools were then used to punch a hole through the remaining cement plug, the top of the formation and then down into the producing sandstone. The plugging operation consisted of forcing special cement into the well under pressure. This cement expands as it sets and provides a high-pressure seal.

Each of the 171 wells is equipped with a pressure gauge and a meter run so that accurate flowing data can be obtained. Certain ones are used as observation wells and are strategically located throughout the field. They most accurately record the static pressure which indicates the over-all field condition.

The Six Lakes Field has a total storage capacity of 53 billion cubic feet at a pressure of 650 psig. There are about 50 miles of 4-, 6-, 8-, 12- and 20-inch-diameter underground gathering lines connecting the 171 wells to four 24-inch main feeder lines. This system is in turn connected to a 20,000-hp compressor plant designed so that the gas can be pumped from the pipeline to storage or from storage to market.

The compressor station is located on a 167-acre tract of land adjoining one of the six lakes from which the region and small town nearby take their names. All machines in the station are cooled with water from the first of the six lakes with the exception of three gas-engine-driven generating sets that have air-cooled, fan-type heat exchangers. There are two reasons for the latter. One is that the



#### POWER SUPPLY

The line-up of three gas-engine-driven generator sets is shown in the picture above. The 4-cycle, 6-cylinder Ingersoll-Rand units develop 408 hp each and drive General Electric 280-kw generators at 514 rpm. The generator sets, unlike other equipment at Six Lakes Station, are equipped with independent, fan-type, air-cooled heat exchangers so that they may be run even if the plant cooling-water system is not in operation. The cooling-water supply for the other engines in the plant, as well as for the compressors, comes from the first of the six lakes from which the field and a nearby small town take their name. The water is returned to a channel connecting numbers 1 and 2 after use.

station has no outside power source, and because water has to be pumped from the lake, it follows that the generators must be in operation before the lake coolant system can be activated. The other reason is largely economical—the station compressors need not run all the time, and with air-cooled exchangers on the generators, there is no need to operate the necessarily large water cooling system for the use of the generators. At least one, of course, must be in operation at all times to supply electricity for lights, controls, starting air compressors and the dispatcher's radio system that links the station with Detroit and the feeder pipelines. The gas-engine power sets are made up of Ingersoll-Rand PSVG engines driving General Electric generators. The 6-cylinder, 4-cycle engines are rated at 408 hp and operate at 514 rpm. The 480-volt, 3-phase, 60-cycle generators are rated at 280 kw.

Nine Ingersoll-Rand 2000-bhp Type 412 KVS turbocharged, 4-cycle gas-engine-driven compressors and two similar 1000-bhp Type 26 KVS units are installed at the station. These engines were chosen to assure the most economical operation over an extremely wide operating range. Because the load on the station varies almost continuously from 0- to 100-percent capacity, depending on the quantity of gas received from the line, or that must be returned to the line, it sometimes is necessary to run only one of the 1000-hp machines at partial load. Or, it may be necessary to run all machines or any combination of them.

In addition, there is a wide range of compression ratios that must be met. Gas is stored in the field at pressures to 600-650 psi, being received at about half that pressure. Then too, gas must be delivered back into the lines in winter-time at pressures up to 900 psi or more.

The pressure in the field (suction pressure), of course, varies with the quantity of gas in it. The inherent adaptability of 4-cycle engines to load variations is also of aid in meeting the widely fluctuating demands on the compressors.

The capacity control system on the compressor cylinders makes it possible to utilize the engines most efficiently. Clearance pockets are designed specifically for this type of installation: each cylinder on the KVS units has three, one on the frame end and two on the outer head. The two outer head pockets provide four regulatory steps because one is approximately half the size of the other. In other words, pocket No. 1 has clearance space approximately equal to one-third of the total volume, and No. 2 makes up the balance or two-thirds. Thus all, two-thirds, one-third or none of the clearance space can be utilized.

Both the KVS compressors and the PSVG engine-generators are started by admitting compressed air to the power cylinders in firing sequence. Two Ingersoll-Rand Class ES 2-stage machines delivering air at 250-psi pressure are installed in the plant for that purpose. In normal operation, both units are electric-motor-driven, however, again because

#### DEHYDRATOR RECYCLE COMPRESSORS

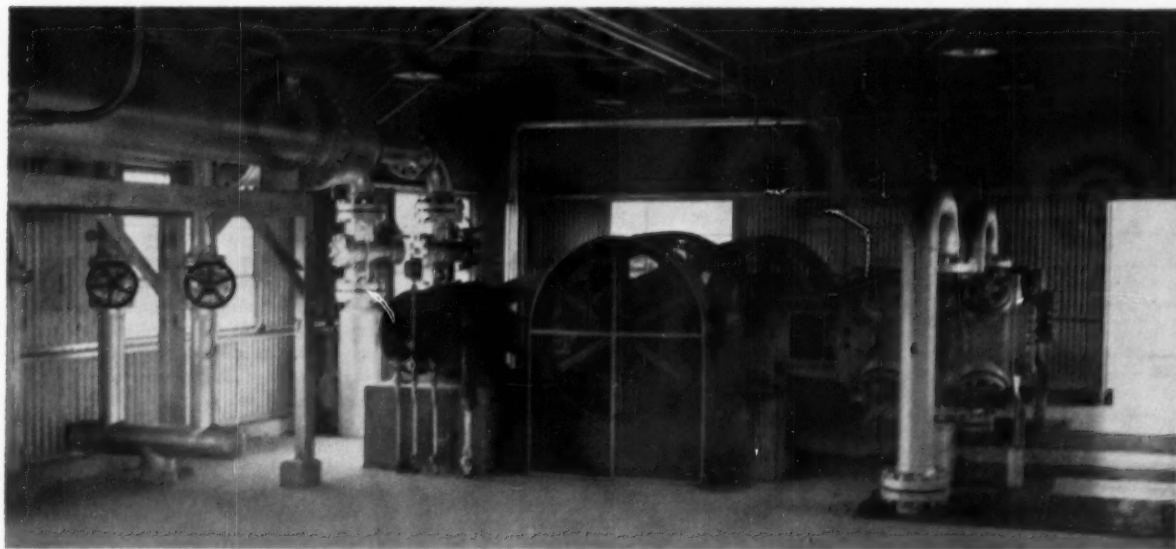
The compressors shown in this illustration circulate field gas at pressures ranging from 215 psi to the field maximum. The inlet or suction pressure on the units varies with that in Six Lakes Field. The compressors, driven by 75-hp electric motors and handling approximately 465 cfm, are required to produce only sufficient pressure differential to move the recycle gas through heaters, dehydrators and moisture stripping towers. Of Ingersoll-Rand manufacture, the class ES single-stage, double-acting machines have special cylinders to withstand the high pressures involved.

there is no external power source for the plant, some arrangements must be made for compressing starting air in case all of the generators should be shut down. Therefore one of the ES machines is equipped with an alternate-drive Continental Red Seal engine. The compressors are V-belt driven, and it is only a matter of minutes to switch the belts from the electric motor to the gasoline engine that can be started either with a battery-powered or manual crank. Air from the compressors is stored in three receivers at the discharge pressure. The plant is also equipped with emergency air-operated and air-controlled shut-down valves which draw their supply from the starting air machines. More will be said about this phase of the plant design.

Gas is routed to the Six Lakes Field from a receiving station on the outskirts of Detroit. All that is not required for use bypasses the city in a 30-inch line and enters two 24-inch lines that carry it to the field. There, if its pressure is lower than that underground, the compressors force it through the field gathering system and into the wells. This operation is carried on from about May to October. The rest of the year the compressors take suction from the wells and put gas back into the pipeline.

There is a double-suction/double-discharge manifold system at the station, because at times gas is directed via another header to Grand Rapids. The latter line has a pressure rating considerably below that of the main Detroit line, and to avoid the waste of compressing gas to a higher pressure than is needed and then reducing it, valves can be set so that some of the machines can be used to route gas to Grand Rapids at 300 psi, while other operate at pressures up to 975 psi to feed the Detroit line.

When the gas is pushed underground,





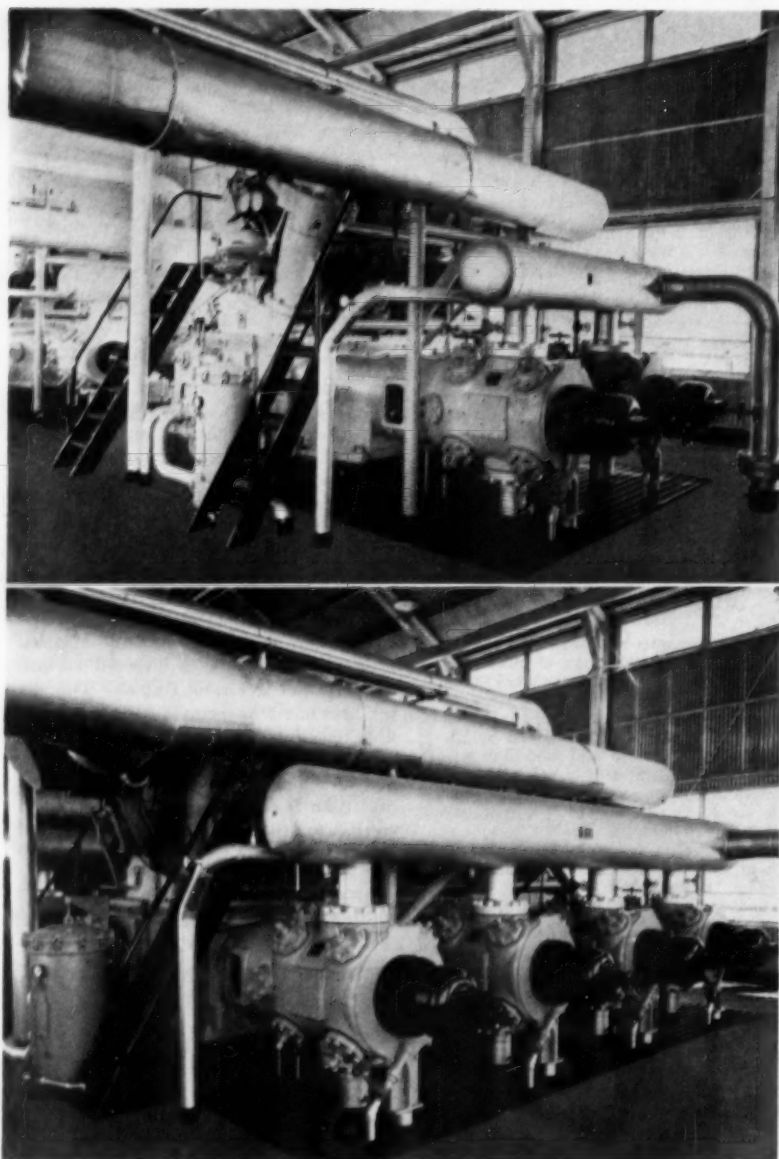
it is first routed through scrubbers where it is cleaned up to avoid contaminating or plugging the wells, and is then metered. The process is the same when the gas is withdrawn, except that it is also dehydrated before being pumped into the

Detroit-bound mains. There are three horizontal contactors. The units are of the dry dessicant type and must be regenerated at periodic intervals. Regenerating requires running a stream of heated gas through them, thus picking

up the moisture, and then stripping the moisture from the gas in cooling towers. The normal cycle for a dehydrator calls for about 16 hours on stream, 4 hours of regeneration and approximately 4 hours for cooling. The gas used to regenerate the dehydrators is field gas—to use any other medium would mean that the system would have to be purged prior to the next on-stream cycle. Approximately 1,000,000 cubic feet of gas per hour is required for the regeneration cycle which is carried on at about field pressure. Two Ingersoll-Rand Class ES-1, V-belt-driven compressors are used for the recycling of regenerator gas. The units produce a pressure differential of only about 10 to 15 psi, but handle gas at pressures up to the field maximum. In other words they are more in the nature of pumps and are required only to overcome the resistance of the gas.

Six Lakes Station was designed and built by Stearns-Roger Manufacturing Company under the direction of Michigan Consolidated Gas Company personnel. The station and necessary appurtenant equipment were designed for a maximum pressure of 1000 psi, that being the rating of the gas compressors as well. On both suction and discharge lines, hot extruded pipe fittings were used. Rockwell-Nordstrom plug valves were installed.

The station is well protected from the hazards associated with the handling of natural gas. Numerous hand propelled CO<sub>2</sub>-type fire extinguishers are spotted around the station and a fire truck is kept in readiness at all times. Should a mishap occur, an elaborate emergency shutdown and/or blowdown system can be activated from any of five strategically placed stations. The latter rely on compressed air. Some distance from the station, both on the field and the pipeline sides, are air-actuated valves. Opening a cock at any of the five emergency stations automatically closes these, isolating the station. At the same time, the central fuel supply to the engines is cut off. Then, if on investigation the trouble is found to be serious, the second or blowdown phase of the emergency procedure can be actuated. Also air controlled, this results in the immediate dumping to atmosphere through a standpipe of all station lines and vessels. Although the escaping gas is not intentionally ignited, the stand pipe is located so that if it does flare, no harm will be done. The reason for having a 2-step control of this type is simply to assure that, unless absolutely necessary, the station need not be shut down for any length of time—if it is necessary to blow down, complete purging of all equipment is required before the station can return to operation, and that is a lengthy process. According to many station engineers, most troubles can be corrected just by isolating the plant.

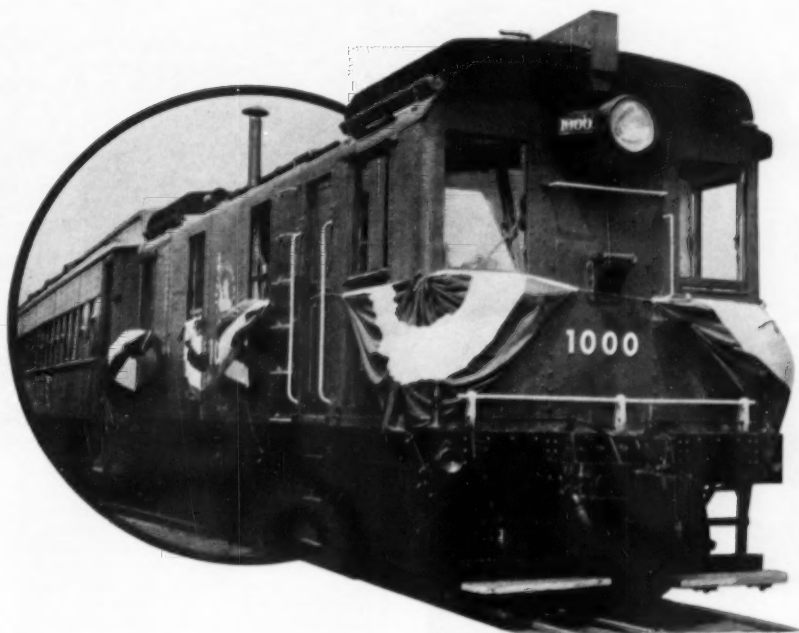


#### 20,000-HP COMPRESSOR INSTALLATION

Eleven machines make up the Six Lakes compressor layout—nine of 2000-hp rating and two of 1000 hp. This arrangement was selected to make easy the task of matching station output either to gas supplies coming in or to that required by winter demands. Because the 4-cycle engines are inherently stable at less than full loads, the station output may thus be regulated almost infinitely between a low of, say, 500 hp and the maximum. The picture at the top shows one of the 1000-hp machines; a 2000-hp unit is illustrated directly above. Shown on the outer heads of the compressor cylinders in the two pictures are the special clearance pockets that fit the units for the widely varying demands of the station. There are three pockets on each cylinder—one is located on the frame end (top of the cylinders, next to the engine-compressor frame) and the other two are in the outer head. The latter, because one is approximately half the volume of the other, provide four regulatory steps from no to full clearance. With all the pockets open, each cylinder delivers about 15 percent of its rating. That type of capacity-control system is required because compression ratios vary markedly throughout the year as a result of the variable field pressure. The machines are Ingersoll-Rand KVS units.

# NO. 1000 TO HALL OF FAME

First Commercially Successful Diesel-Electric Locomotive Has Retired



S. M. PARKHILL

centage of passenger train business was 88.55 to 5.20, respectively. By 1956, the steamers were hauling 8.9 percent of the ton miles of freight, as compared to the diesel-electric's 88.5 percent; and the steam engine was accumulating only 2.5 percent of the passenger car miles as compared to 91 percent for the diesel. (The percentages not accounted for represent straight electric railroading.)

The epoch that Skerrett prophesied is here and its forerunner, "Old 1000," after 32 years of day-to-day service, has retired. Early this fall it is destined for the Baltimore & Ohio Railroad Museum in Baltimore, Md. There it will take its place beside such other notable engines as Peter Cooper's 1-ton steam locomotive, the Tom Thumb; the Atlantic; The Memnon, famed for its Civil War service and frequently called Old War Horse; and Old 592, the last of the Atlantic-type camelback steam engines used in the United States.

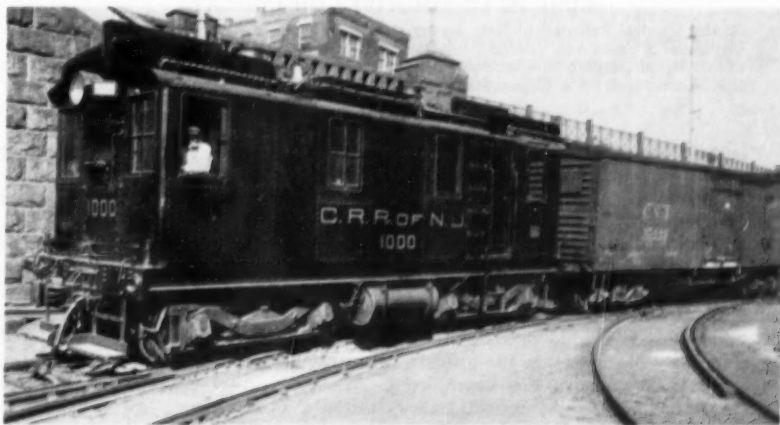
**A**NOTHER milestone in engineering progress has been reached, and this achievement is likely to prove of an epoch-making character. We refer to the development of an extremely promising type of oil-electric locomotive intended primarily for switching service. The unit in question is the first of its kind produced in the United States . . .

These were the words of Robert G. Skerrett in an editorial in COMPRESSED AIR MAGAZINE, May 1924. The unit to which he was referring was built that year by Ingersoll-Rand Company and General Electric Company. It was an experimental diesel-electric locomotive that was demonstrated on several railroads. This demonstrator has since been dismantled, but its performance was satisfactory enough to cause ALCO Products, Inc., then American Locomotive Company, to join the other two firms in the production of diesel-electrics, the first commercially successful of which was The Central Railroad Company of New Jersey's No. 1000.

By 1930, American railroads had placed 74 diesel-electric locomotives in service. Five years later, the number had increased to 113 units; in 1940 to 787. The total had reached 3816 in 1945, and by 1950 was slightly more than 14,000. By the end of 1956, there were about 27,000 of these engines in use, as

compared to only 3690 steam models.

Since 1940, the steamer and the diesel-electric have reversed positions regarding the percentage of railroad work each performs. In that year, the steam engine hauled 97.53 percent of the gross ton miles of freight as compared to the diesel-electric's total of 0.05 percent. The per-



## FIRST RUN

Jersey Central Railroad engineer William (Billy) Mason is shown in the cab of the only oil-electric locomotive owned by a United States railroad at that time. Today, more than 27,000 units are in operation. The 60-ton engine began its service in October 1925, and continued working day-to-day for 32 years. On the top can be seen the fin-type radiators. The pictures were taken at Jersey Central's Bronx, New York terminal.



#### CONTRAST IN POWER

The original No. 1000 (right) is not as dwarfed as one might expect beside two contemporary 1600-hp road switchers, at the immediate left. The power rating, however, of these modern diesel-electrics is more than five times that of the 300-hp pioneer. Despite the difference, the diesel engines and generators in each are within a few pounds of the same weight—a graphic example of how horsepower-per-pound has increased in the years since 1925, when ALCO Products, Inc., General Electric and Ingersoll-Rand jointly produced "Old 1000." On the extreme left of the picture above is a 1500-hp road freight diesel and to its right, a 2000-hp suburban passenger locomotive. Between it, and the road switchers, is a 2400-hp all-purpose unit.

#### MUSEUM LOCOMOTIVES ON DISPLAY

At the Central Railroad of New Jersey station in Jersey City, N.J., No. 1000 was displayed 3 years ago. Behind this railroad "first" can be seen No. 592, the last of the Atlantic-type camelback steam engines. "Old 1000" will join the steamer at the Baltimore & Ohio Railroad Museum in Baltimore, Md.

The building of No. 1000 represented a unique 3-way effort. The chassis, body and trucks, manufactured by ALCO Products, Inc., were delivered to the General Electric plant at Erie, Pa. Electrical equipment was added, as was a diesel engine, manufactured by Ingersoll-Rand Company. All three manufacturers ranked, in 1925, as they do today, among the leaders in their fields. At Erie, the locomotive was assembled and tested prior to travelling 470 miles to the I-R plant in Phillipsburg, N.J. That trip, on September 1, 1925, took 16 hours and 110 gallons of fuel oil. The total fuel cost was only \$5.50. Along the route, according to R. Tom Sawyer, one of the service engineers, the unit was welcomed, but was generally not noticed

except as a curiosity. When it arrived at its destination, it was demonstrated for about 2 months before it was purchased by the Jersey Central Lines. The listing, "1 Oil-Electric Locomotive" under the New Equipment column of the company's report for the year ending 1925, marked the first railroad ownership of a diesel-electric locomotive in the United States.

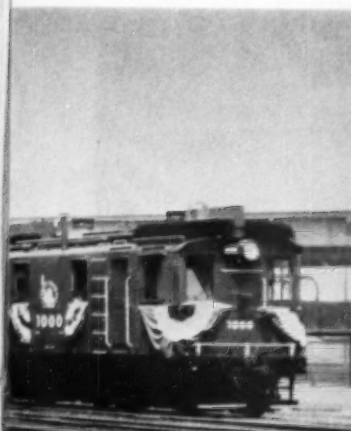
The arrival of "Old 1000" did not initially set the railroading scene on its ear. To many, the engine was an interesting freak, not really very practical. Others thought it held promise, but only a small handful would go so far as to predict that No. 1000 spelled the doom of the steam locomotive.

There are many interesting stories

about tugs-of-war between steamers and the early diesels. In one instance, a little diesel twice pulled a steamer backwards. Each time, railroad officials claimed a foul. The third time, the diesel let itself be pulled for a considerable distance before applying power. The steam locomotive dumped its fire box and was unable to compete any more that day. This word spread like wildfire through railroad circles. It was unbelievable that the great steamers could be outdrawn by anything such as a diesel.

From October 22, 1925, No. 1000 spent most of its active life switching cars in a freight yard. On June 13, 1957, it retired with considerably more fanfare than it was accorded when it began service. For that last trip, the boxlike unit pulled two passenger coaches of newsmen and guests from Jersey City to Elizabethport, N.J., and back again. All along the 9.6-mile route, railroaders waved friendly greetings and passing locomotives blew salutes.





No. 1000 was the first of four locomotives that were built and stocked before orders were received. Two of the others were identical 60-ton units, one of which was delivered to the Baltimore & Ohio Railroad in December 1925, and the other, to the Lehigh Valley Railroad in January of the following year. The fourth, sold to the Long Island Rail Road, was a 600-hp 100-ton model. It was similar in design except that it had two of the 300-hp diesel engines and main generators, and four 200-hp traction motors. Some 100 diesel electrics, ranging in size from 60 to 110 tons, were manufactured by the three companies until 1936.

The Ingersoll-Rand engine built for "Old 1000" was a great step ahead, for at the time it was America's first lightweight high-speed diesel. It develops 300 hp at 600 rpm and weighs 60 pounds per horsepower. The average diesel of the period operated at about 250 rpm and weighed from 175 to 250 pounds per horsepower. It was started by compressed air, whereas today, diesels are electrically started.

The engine is a verticle, 6-cylinder, 4-cycle model with a 10-inch bore and a 12-inch stroke. It features solid (direct)

fuel injection, accomplished by means of a single plunger pump delivering oil to all six cylinders through a distributor valve, rotating intermittently by means of a Geneva motion. With this fuel injection pump two opposed spray nozzles are used in each combustion chamber.

The lubricating system is entirely enclosed and is of the force-feed type. It is equipped with a cloth bag-type filter that was, at the time, a novelty.

In the cooling water system, water is circulated by centrifugal pumps driven from the engine camshaft. Fin-type radiators are located on top of the locomotive.

The electrical energy developed by the engine and its direct-connected 600-volt generator is utilized by 95-hp traction motors geared to the driving axles. The motors are series-wound, totally enclosed, split-frame, commutating pole units and were manufactured by General Electric Company.

The generator in No. 1000 is a direct-current, compound-wound, commutating-pole unit. A 60-volt exciter, mounted on the same shaft as the generator, is used. This exciter also charges a 32-volt storage battery for lighting and control current.

The electrical control system pioneered the basic principles of the systems in virtually every diesel-electric in operation today. It is based on a patent secured by Herman Lemp of General Electric in 1914. He had worked on locomotive development for the Thompson-Houston Company, a forerunner of GE, and was active in the development of internally powered locomotive equipment to such an extent that he was awarded the George R. Henderson Medal by the Franklin Institute in 1951.

The system eliminated all resistors, moving parts and manual control of the generator field. In operation, the controller handle is thrown into either for-

#### CONTRAST IN FANFARE

At the lower left, William Mason accepts a floral tribute from a Jersey Central Railroad stenographer. The simple ceremonies, held in 1925, marked the beginning of service for the first successful oil-electric locomotive in the United States. Thirty-two years later (left), Thomas D. Campbell, the engineer who piloted the unit from the Ingersoll-Rand plant in Phillipsburg to Jersey City, N.J., joins well wishers in elaborate ceremonies before "Old 1000" made its last run on June 13, 1957.

ward or reverse, and power is governed by regulating the engine speed by means of a throttle handle. The generators and motors automatically adjust the proportion of torque and speed to meet the changing requirements of acceleration and grade.

ALCO Products, Inc., fabricated the locomotive body, frame and trucks in its Schenectady shops. The box-shaped cab is divided into three sections; an operator's compartment is at either end, and between them are the engine, main generator and auxiliary apparatus.

The length of the locomotive inside the knuckles is 32 feet 8 inches. The width of the cab is 9 feet 4 inches, and its rigid wheel base is 7 feet 2 inches long. Its total weight of 120,000 pounds is distributed equally over the four axles. Tractive effort is rated at 36,000 pounds at 30 percent of adhesion maintained to 1 mile per hour. The locomotive has eight wheels, each 36 inches in diameter, and it can operate on curves with a minimum radius of 90 feet. The brakes are inside hung, acting on all wheels from a single air cylinder.

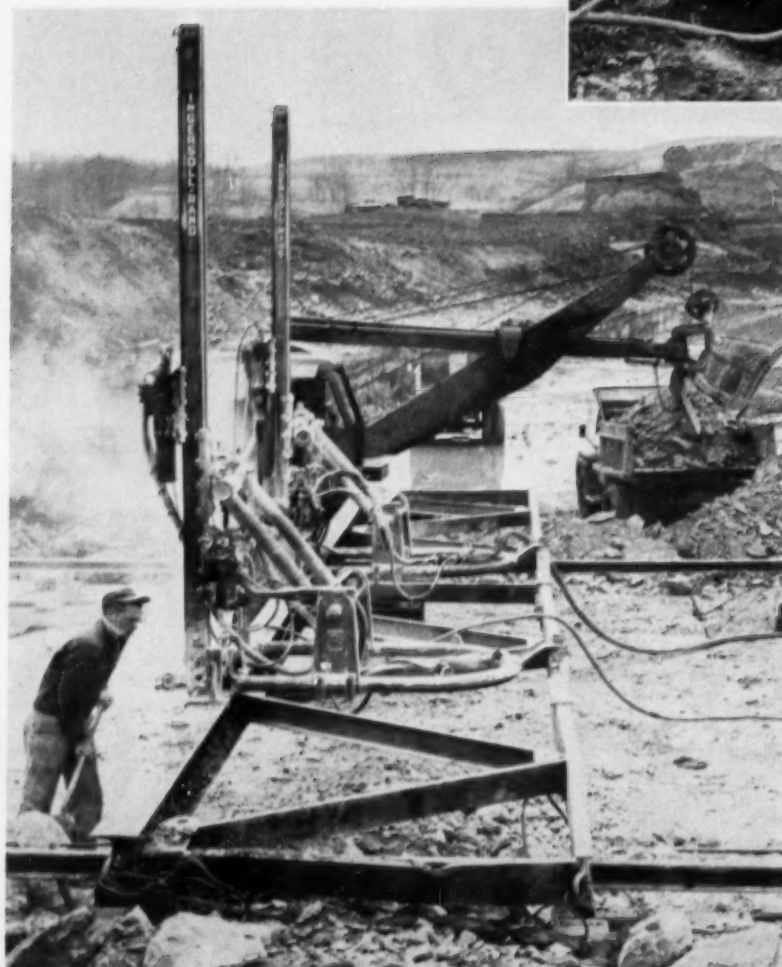
As the forerunner of thousands of diesel-electric locomotives in use, "Old 1000" offered economy of operation and maintenance similar to the same advantages presented by the bigger and more powerful diesels in service today. When the prototype model was introduced, its oil-electric drive was rated at a thermal efficiency of 30 to 35 percent. Operating fuel costs were estimated by the operating manual at from one-third to one-sixth the cost of running an equivalent steam locomotive, and maintenance costs were set at half those for a steamer with the same capabilities. The utilization factor was set at about 80 percent, or double that for a steam locomotive.

Efficiencies have improved since 1925, just as locomotive dimensions and specifications have increased. One possible comparison can be drawn with a 2400-hp diesel-electric road switcher. Horsepower is far out of proportion with the weight increase—No. 1000 weighs 60 tons while the road switcher, with 2100 more horsepower, weighs 167 tons. The modern diesel is more than 66 feet long or better than twice the length of No. 1000. It can operate at nearly three times the speed.

# FLOOD CONTROL ON THE IOWA RIVER

\$15 Million Coralville Dam  
To Tame Floods And  
Stabilize River Flow

HAROLD STICKLER



## DRILLS AND AIR SUPPLY

The picture above shows the Armstrong-designed drilling template that has speeded drilling operations on the spillway section of the Coralville project. Framed in front by a 12-inch H-beam and in back by a 10-inch channel iron, the rig carries two Ingersoll-Rand FM 4 wagon mountings, on each of which is an Ingersoll-Rand Company X-71 drifter. The device is used not only for blast hole drilling, but to line-drill and broach the walls of the weir section leading into the spillway. Work on the weir is being done in monoliths of 45x30 feet and the drill rig, when drilling the 3x3-foot blast pattern, is mounted on railroad irons not only to facilitate moving it, but to keep it level as well. The picture at the top shows the I-R 315-cfm Gyro-Flo (rotary) compressor supplying air to the drills. Carset (tungsten carbide insert) bits in 2- and 2½-inch sizes are used. The other picture (right) shows the even walls of the weir section produced by the drilling and broaching work of the drill template.

ALMOST every spring the rains come to Iowa, providing moisture for the state so aptly named "the breadbasket of the world." And when the rains fall on land saturated with a heavy winter's snowfall, the rivers and creeks in the state swell and overflow their banks. One of these that, almost without exception, makes annual excursions into the rich fields along its valley is the Iowa. Springing from the lush farmlands of the north central part of the state, it flows in a generally southeastward direction eventually joining the Mississippi River about halfway between Burlington and Muscatine. Some 50 to 60 miles upstream from its mouth, U.S. Army Corps of Engineers, Rock Island (Illinois) District, are supervising the erection of a \$15 million barrier to intercept, and store for later release dur-



ing dry spells, the runoff from a 3084-square-mile drainage area.

To be known as the Coralville Dam, the earth embankment structure is about 6 miles north of Iowa City, site of the State University, and is a part of an over-all scheme to provide flood controls for the entire Mississippi River Valley. When completed, it will back up the river for a distance of 17.4 miles in normal times. This conservation pool, as it is termed, will have a surface area of 1820 acres and a storage volume of 17,000 acre-feet. Maximum, or flood-control, capacity of the dam will be 475,000 acre-feet, and the reservoir will then extend for 41.5 miles up the Iowa, covering an area of 24,000 acres.

The features of the Coralville project actually total four: the earth embankment itself, outlet or control works, a spillway and the reservoir. The earth embankment will be roughly 100 feet high when completed and is to be 1400 feet long and 22 feet wide at the crest. The outlet works is made up of 23-foot-diameter concrete conduit and is about 350 feet long. Three  $8\frac{1}{2}$  x 20-foot control gates discharge into it. Just downstream, a stilling basin will calm the rushing waters, minimizing downstream erosion. The spillway, over which water automatically will discharge when it reaches an elevation of 712 feet above sea level (approximately 42 feet above normal or conservation pool level), is a concrete section 500 feet in length. The conservation pool or reservoir will provide water supplies to lessen adverse effects of dry spells on downstream areas, aiding in pollution abatement and the preservation of fish and wildlife. Its effects will be felt not only on the Iowa River, but on the Mississippi below the confluence of the two streams, as far away as St. Louis, Mo.

Work at Coralville is being done as a joint venture by two Iowa contractors—

J. D. Armstrong Company, Inc., Ames, and the Weitz Company, Inc., Des Moines. The former is handling earth and rock excavation and the actual dam construction, while the latter is doing concrete placement and structures. The project started in 1949 and is now nearing completion. The deadline for the job is July 1, 1958, but the actual finish may come much sooner. The first step in construction of the facility was the removal of earth for the outlet conduit as well as excavation to bedrock for the dam. The conduit itself and the control structure were started in 1950, and were completed 2 years later.

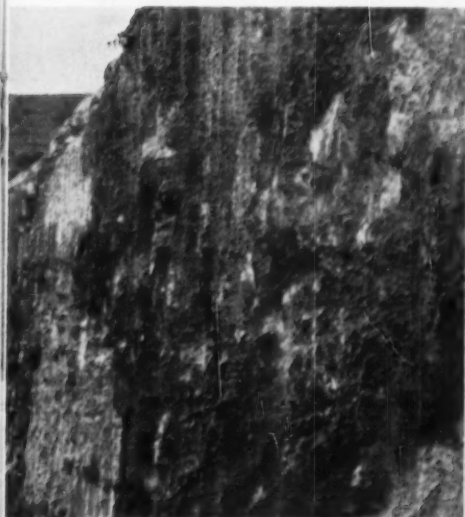
The next stage of operations, earth excavation for the spillway, began September 15, 1956, and was completed December 22. Rock work was started immediately thereafter and is now nearing completion along with the dam itself. When finished, more than 40,000 cubic yards of rock will have been removed from the spillway area.

Construction of the spillway involves the removal of high ground on one side of the dam, including the excavation of a weir in rock, to an elevation of 712 feet, and the preparation of the downstream slope which is to be faced with concrete. An ingenious drill rig has been developed by J. D. Armstrong Company, the contractor, to facilitate the work. Used for line drilling and broaching the walls of the weir section, as well as for blast hole drilling, the device is essentially a template, 48x8 feet in size and mounting two Ingersoll-Rand FM4 wagon rigs equip-

ped with X-71 drills. The front member of the template is a 12-inch H-beam. In the rear is a 10-inch channel iron, and the unit is rigidly cross braced within. The wheels on the FM4 mountings were removed and special shoes mounted in their place. These slide on the H and channel beams, the drill towers being moved back and forth by hand-cranked winches. In operation the entire rig is leveled and because all holes are vertical, the towers have been fixed in that position and the drill guide yoke hoists removed from the units.

The weir work is being done in sections or monoliths measuring 45x30 feet. The template or drill rig is first employed to line drill and broach one wall of the weir, then is turned 90 degrees and mounted on railroad irons to drill a 3x3-foot blast hole pattern. By taking care to position the rails parallel with the weir floor, the contractor expects his drill mounting to reduce the amount of overbreak and thus the amount of concrete overrun. When the blast pattern is completed, the template is again turned 90 degrees to drill and broach the other wall. In all, 16 monoliths will be removed from the weir section which is approximately 480 feet long. Drilling is on a 24-hour schedule—banks of lights have been erected to illuminate the scene at night.

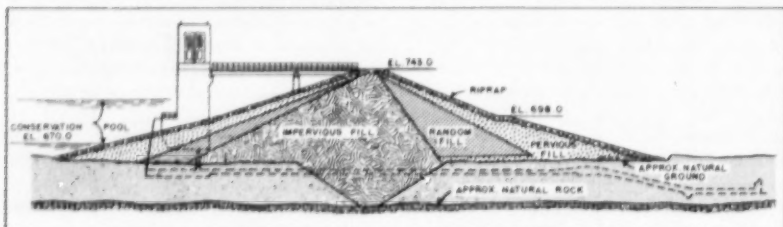
Ingersoll-Rand Carset (tungsten carbide insert) bits are used on both line drilling and broaching, and for blast hole drilling. The line drilling and sinking of blast holes is done with 2-inch bits, while the broaching is done with  $2\frac{1}{2}$ -



#### AERIAL VIEW

Coralville Dam lies virtually in an east-west line across the Iowa River. The aerial view reproduced above shows the downstream—southern—face of the dam. On the east side (right) can be seen the control tower and outlet works. The spillway section is shown at the left. This photograph was taken last fall before much work on the spillway got underway. The dam itself has also risen considerably since then, being approximately four-fifths complete at this time. The conservation pool will extend upstream more than 17 miles; the flood control pool will back up a maximum of 41.5 miles above the earth-fill structure.





#### LOCATION AND DESIGN

Located athwart the Iowa River a few miles from Iowa City, Coralville Dam takes its name from the little nearby town of Coralville (map, above). Not far away, just outside the town of West Branch, is the birthplace of Herbert Hoover. The Iowa and Mississippi rivers join about 50 to 60 miles downstream just below Lock & Dam No. 17 on the Mississippi. (Locks and dams on the "Old Man River" are numbered beginning with No. 1, just outside of Minneapolis and St. Paul, Minn., running to No. 26 near St. Louis, Mo., just above the confluence of the Mississippi and Missouri rivers.) The other sketch shows the cross section of the dam. Containing some 1,250,000 cubic yards of compacted earth, another 57,000 yards of stone rip-rap and 15,000 yards of filler rock will be placed on the faces. The dam is 650 feet thick at the base, tapering to a 22-foot-wide crest.

inch Carsets. The depth of holes varies, of course, with the contour of the rock surface, but usually is in the range of 8 to 16 feet. Hollow-round, 1¼-inch, lug-shank steel is used in lengths of 8 and 16 feet. An I-R 315-cfm Gyro-Flo (rotary) compressor, supplies air for the drills. The Armstrong template will complete some 5700 square feet of line drilling and broaching in the weir section as well as about 12,000 lineal feet of blast-hole work. After the section is complete, the template will be used to drill the blast patterns on the spillway floor—a 600-foot-long water escape-way that is to be 495 feet wide at the upstream end and 300 feet wide at the outlet.

The dam itself, now a little more than four-fifths complete, will contain 1,250,000 cubic yards of pervious and impervious fill as well as 57,000 cubic yards of rip-rap and 15,000 yards of filter stone. The contractor is using an extensive fleet of earthmoving equipment to complete the dam. The majority of the earth fill has been borrowed from the upstream pool and transported to the dam-

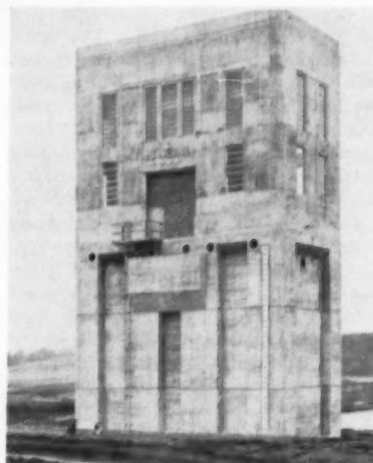
site by scrapers, there to be compacted to specifications by pneumatic-tired and sheepsfoot rollers.

A number of incidental benefits in addition to the primary flood control advantages of the Coralville structure have been outlined by the Corps of Engineers. Because of its proximity to Iowa City and Cedar Rapids, and its location within a prosperous, well-populated farming area, the reservoir can easily be developed into an excellent recreational area, supplementing and expanding the facilities at nearby Lake Macbride State Park. Facilities for fishing, swimming and boating as well as hunting, picnicking and camping will be provided along with such basic facilities as access roads, parking areas, rest stations and potable water supplies.

The land required for the conservation pool will, of course, be lost to agriculture, but arrangements have been made to lease all suitable lands within the confines of the flood control reservoir for farming. Displaced owners and leasees of the appropriated lands are being given

#### CONTROL TOWER

The figures on the scale imposed on the side of the control tower shown in the picture below indicate the height of the pool above sea level. In normal times the conservation pool will not reach the visible portion of the tower which is at about 703 feet elevation. At flood stage, however, the water will rise to 712 feet, at which time it will automatically spill over the 500-foot long spillway. The 712-foot level is at about the lower horizontal line encircling the structure. Access to the tower after the dam is completed will be over a ramp to be built from the dam to the entry-way shown under the "Coralville Dam" sign.



the first opportunity to rent them. The terms and conditions of the leases, while under the control of the Corps of Engineers, follow practices set up by the United States Department of Agriculture and close coöperation between the two agencies is maintained. By law, 75 percent of the moneys received from agricultural leases will be paid to the State of Iowa for the benefit of public schools and roads in the counties in which the property is located, or for defraying any expenses of the respective county governments including public obligations for levee and drainage districts for flood control or drainage improvements.

Col. John L. Wilson, Jr., Corps of Engineers, is in charge of the Rock Island District in which Coralville Dam lies. The resident engineer at the construction site is George L. Roehr, who is directly responsible for the project. Fred Hanson heads construction and Robert E. Clevenstine is Chief of Operations & Construction. Superintendents for the two contracting firms in the joint venture are Dan R. Davis for the J.D. Armstrong Company, and Del Comune, for the Weitz Company.



ALL OFFICIAL U. S. NAVY PHOTOS

## OPERATION DEEP FREEZE

### SITE OF OPERATION DEEP FREEZE

Shown above are seven completed observation stations established in the Antarctica. They are a culmination of the efforts of the U.S. Navy's Operation Deep Freeze for its part in the 1957-58 International Geophysical Year. Using these outposts, 148 scientists and 169 Navy personnel are adding to our knowledge of this frozen wasteland.

**L**IGHTED only by glittering stars and an occasional Aurora Australis, seven small Antarctic outposts battened down the hatches for a long winter's night. The camps were completed just in time for scientists to settle down in preparation for the International Geophysical Year that began July 1. With the setting sun, which won't reappear until October, went 3500 United States military personnel who had hustled around and across the desolate ice-and-snow-covered wasteland. Only 169 Navy Seabees and 148 scientists remain.

The job started 2 years ago and actually eight stations were erected. One, built as an emergency depot, has been abandoned. Two outposts were built inland: one, called the Pole Station, located at the geographical South Pole; and another, called Byrd Station in recognition of Admiral Richard Byrd's extensive work in the Antarctica. Beardmore, an emergency station, was also built inland on the route from an air base station to the polar camp. The remaining five are spotted around the continent and are known as Little America V, which is the base camp; Weddell Station; Cape Hallett; McMurdo Sound, which was the principal air base; and Ellsworth Station. The latter group were established from the sea, supplies and personnel being carried in by cargo ships following in the wake of icebreakers. Byrd Station was supplied by tractor-drawn sled trains from Little America V, and the Pole Station was developed with parachuted supplies flown from McMurdo Sound.

Frequently the hazards of locating the seven observation posts seemed insur-

mountable. One such job was the founding of Byrd Station in Marie Byrd Land, high on Rockefeller Plateau, and about 660 miles from Little America V.

### BYRD STATION

Late in the 1955-56 summer season, a train of heavy equipment set out from Little America V. The idea was to establish a fuel cache 360 miles away on the route to the proposed Byrd Station. Weasels—light tracked vehicles about the size of a jeep—personnel carriers, and LGP (low ground pressure) tractors, so called because they exert a pressure of less than 4 psi on the ground surface, made up the mechanical force. When only 200 miles from the base, the expedition encountered a heavily crevassed section of ice. Cracks large enough to swallow the *Queen Mary* interlaced a 5-mile belt at the line where Ross Ice meets the mountains rising to Rockefeller Plateau. Most were bridged with snow, making it impossible to see them.

Unable to go around the belt, the expedition started across, gingerly feeling its way. When a chasm was located, it was blasted open with explosives, and bulldozers filled it with snow. In one instance, when a unit was backing away from one crevasse to get another blade-load of snow, it plunged backward and 100 feet down into another unseen chasm.

This year, the men returned with a crevasse detector that had been developed in the Arctic. It consists of two dishpan-shaped transmitters, mounted on a weasel. These send 3000-volt impulses forward into the snow and ice. Five more "dishpans," attached to booms, slide ahead over the snow, receiving the signals from the transmitters. Voids under the surface, both across and parallel with the trail, affect the signals, thus pinpointing danger spots so that they can be marked.

It required 16 days and 4700 pounds of explosives to pass through the area,



### AIR-DROPPED CAT

At the South Pole, a Cat D2 tractor pulls a load of fuel barrels from the drop zone to camp. Although the cab was parachuted in with the tractor, the Seabees in their race with the daylight season, didn't take time to mount it. An interesting point about this illustration is that every way one looks, the direction is North.

but the battle was won and the party sped on, marking the trail every fifth of a mile with red flags on bamboo poles. These markers were aligned through binoculars, and the result was a straighter path than would have been possible with a compass.

On the morning of December 5, 1956, as the trail-blazers neared the heart of Marie Byrd Land, the Antarctica's first tractor train set out from Little America V. Six LGP tractors, each pulling two 26-ton sleds; another pulling sleeping and messing wannigans; and a weasel, delivered 160 tons of cargo to begin the construction of Byrd Station. The 632-mile journey was made in just 18 days and 2 hours.

Extreme caution had to be exercised in crossing the crevassed area. Only one 72,000-pound tractor at a time, pulling one 26-ton sled, would venture up the 7½-mile-trail. After waiting for the "nervous" ice to settle, another load was sent across. As an extra precaution, operators walked behind their tractors, guiding them by reins attached to steering and master clutch levers. In the event a tractor should break through, the men would then have had a chance to jump clear. When the train safely reached Byrd Station, the men found 30 tons of fuel, accurately dropped at the site by U.S. Navy and Air Force planes, for their use on the return trip to Little America V. Although each tractor had

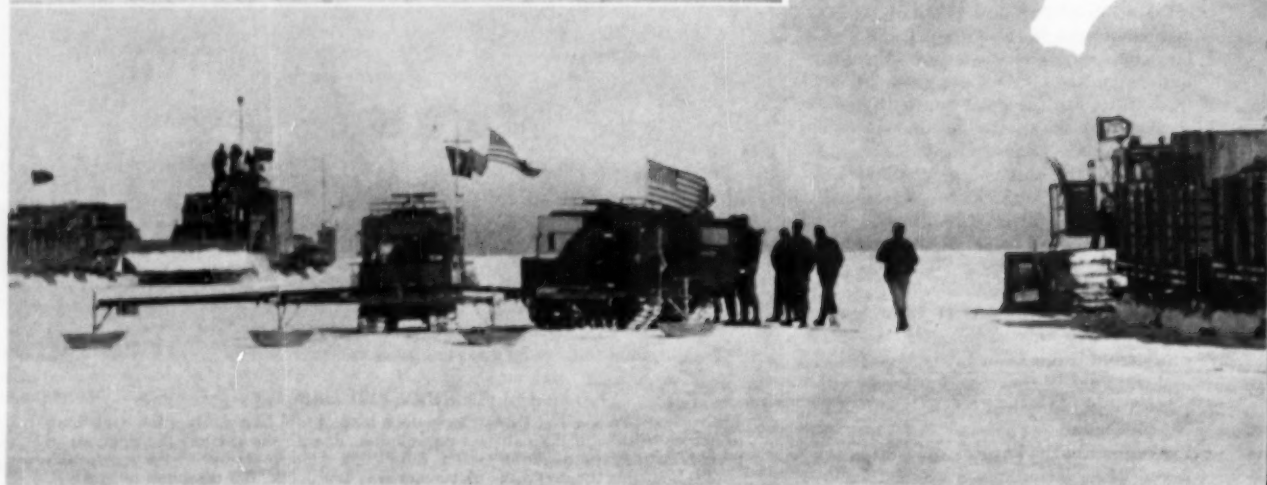
more than 1500 running hours from the previous summer's operations, they had to make the round trip with pauses only for refueling. Due to the extreme cold, tractor engines could be shut down only for brief servicing. A cold engine would require as many as 8 hours of preheating under a tarpaulin to warm it enough for starting. Two more trips were made before the sun sank to deliver the required 500 tons of equipment.

Meanwhile other phases of Operation Deep Freeze were presenting obstacles. A storm of hurricane intensity on New Years Day (1957) drove ice against the USS *Arneb* which was unloading supplies for the Cape Hallett Station. Pressure ridges in the ice that packed into the area to the extent of 200 square miles, sprung bulkheads and slit the vessel's hull below the water line. The icebreaker USS *Northwind*, struggling to the aid of the *Arneb*, lost a blade from her starboard screw. On the opposite side of the continent, trying to reach Bowman Peninsula to establish Weddel Station, an icebreaker and cargo ship were stuck in the treacherous ice. Slush froze around the vessels as each day the sun sank lower. The icebreaker, USS *Staten Island* lost a blade from one of her propellers and had consumed more than half her fuel in an unsuccessful battle against the ice. The USS *Wyandot* had worn the tips from all her blades, reducing her speed to 10 knots. The season was rapidly drawing to a close and the vessels were 370 miles from the site of the station.

Nature finally relented however, and

#### OFF-LOADING OPERATIONS

Below can be seen the USS "Arneb." Low Ground Pressure Caterpillar D8 tractors spotted empty sleds alongside the vessel, then retreated. Sleds were then loaded and retrieved by cable to lessen the danger of breaking through the ice.





the elements combined to assist the men and vessels. Friendly winds from the south drove the ice to sea, freeing the *Arneb* and the *Northwind*. On the "other side of the world" favorable winds and temperatures opened a passage to Bowman Peninsula for the *Staten Island* and the *Wyandot*.

The ruptures on the hull of the *Arneb* were repaired and she, along with the *Northwind* returned to Cape Hallett. After a 3-week layover, they started south again, being joined by the USS *Glacier*, the world's largest icebreaker, and the cargo ship, USNS *Greenville Victory*. The convoy made the assault on

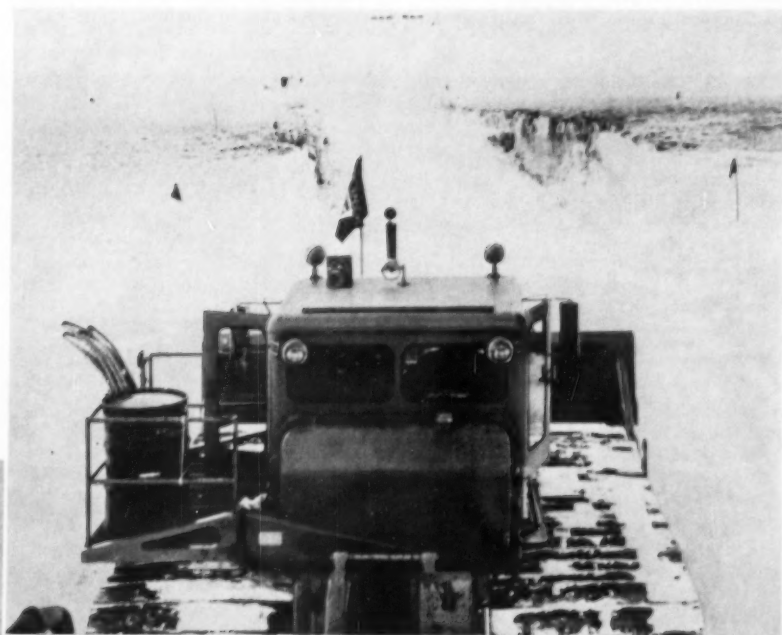
Budd Coast to establish Ellsworth Station.

Again the heavy pack ice fought back, and three times the *Glacier* crunched through, only to reach a dead end at an ice wall. On the fourth try, late in January of this year, in the face of a waning season and when despair was near, the ships broke through the 125-mile belt of ice.

A 15-foot ice shelf still stood in the way of landing operations. First men went ashore, with picks, shovels and 12 tons of explosives to rip a path through the shelf. Then a Caterpillar Traxcavator was brought in to shave a gentle ramp for the heavier tractors. Construction had been expected to take at least 7 weeks, however 2 weeks later the camp was completed. It consisted of sixteen buildings, a forest of radio masts, and odd-shaped domes and towers.

#### CREVASSE CROSSING

Crevasse under a layer of snow at first proved death traps for 37-ton Low Ground Pressure (LGP) Caterpillar D8s and their two 26-ton sleds. By adding dishpan-like electronic devices to a weasel (bottom left), they were easily detected and bridged. The two trailing dishes transmitted 3000 volts into the snow and the five forward ones picked up the signals, thus warning the operator of unseen voids. Directly below, with open doors for a possible quick escape, the Seabees approach a giant crevasse that has been blasted open and subsequently filled with 105,000 cubic yards of snow. The safe trail is marked by the double row of flags. At the bottom (right) is the first tractor train approaching the 640-mile cache a few miles away from Byrd Station. Two of the Caterpillar LGP D8 tractors carry unloading equipment for setting up camp sites.



#### AIRLIFT TO THE POLE

At McMurdo Sound an airbase was wrested last winter from Antarctica in 2 dark cold months. First of all the construction crews had tried to compact the snow into runways as had been done in the Arctic, but failed to get it packed tightly enough to support the 90-ton Globemaster aircraft that were to be used to airlift supplies to the polar station. Next pumping seawater over the snow and letting it freeze into a solid mass was tried. Blowing snow mixed with the water, however, resulted in a surface that was full of treacherous soft slush spots. The only alternative was to scrape the snow cover from the underlying ice. This phase started July 23,



1956, and work was carried on around the clock. Portable generators were used to light the scene for the sun would not rise until the following September. The temperature at the base dipped to a low of  $-60^{\circ}\text{F}$ , and men running "Pogo," the only bulldozer at the base, were relieved every 45 minutes. By the end of the job, 8000 hours had been logged on the tractor—nearly all of it in continuous service over a 2-month stretch.

History was made on October 29, 1956, when Rear Admiral George J. Dufek stepped from a plane at the South Pole, the first man to set foot there since the ill-fated Scott Expedition 44 years previously. Three weeks later a colony had been set up consisting of eight men and eleven dogs. They were housed in tents.

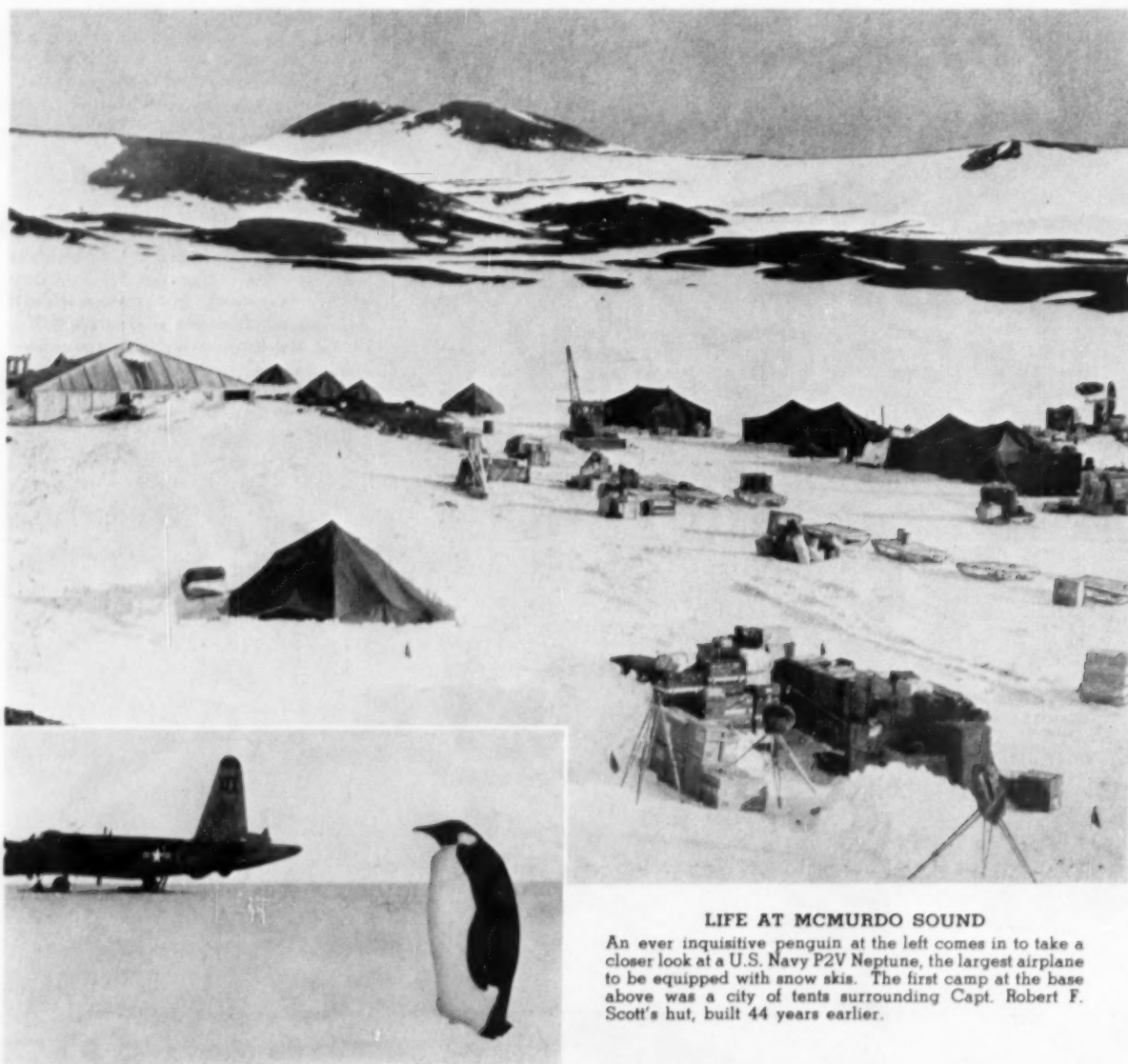
Then giant Air Force Globemasters moved in, parachuting the needed 500

tons of supplies for the station in an around-the-clock operation. Largest single load of the airlift was a Caterpillar D2 Tractor. With the cab and tracks removed, the machine weighed 7 tons and was so large that it just barely cleared the sides of the elevator well in the aircraft. The machine was operating in less than an hour after it was dropped.

The ground force at the pole was increased to 24 men, and the job was completed in only 6 weeks. The station is housing 18 men this winter. The temperature at the pole ranged from  $-25^{\circ}$  to  $-35^{\circ}\text{F}$  during the operation. The South Pole, incidentally, is at an altitude of 10,000 feet above sea level, and that posed many problems for the men and machines working in the rarified atmosphere. At the end of the job, the construction crews were returned to

McMurdo by smaller planes that could land on the snow capped terrain around the pole.

Thus Operation Deep Freeze was completed. At the present time, 317 men are wintering in the cruel land. Reports have already come in that some of the lowest natural temperatures ever recorded on the earth have been experienced. The end result of the efforts of the construction crews and the scientific and service personnel should be well worth while. Combined with reports from other stations the world over, the data gleaned now should make it possible for us to better understand the world. It may have far reaching effects, for example, on the accuracy of weather forecasts, climatology, etc. Certain data may also be useful from a military standpoint, although that is not the primary purpose of the investigations.



#### LIFE AT MCMURDO SOUND

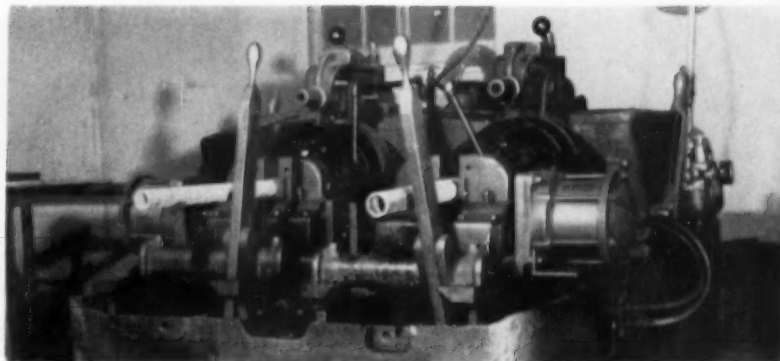
An ever inquisitive penguin at the left comes in to take a closer look at a U.S. Navy P2V Neptune, the largest airplane to be equipped with snow skis. The first camp at the base above was a city of tents surrounding Capt. Robert F. Scott's hut, built 44 years earlier.

## PLUMBING CONTRACTS

Morris P. Rosen

**C**OMPRESSED-AIR power is being applied to shop fabrication by Waldo Plumbing & Heating Company of Phoenix, Ariz. This 50-man \$1½-2 million annual-gross operation is constantly looking for adaptable ideas that will not only eliminate some of the tediousness that is part of a pipe fitter's work, but at the same time is seeking to improve quality and increase production. As a result of these needs—ones generally accepted in most concerns—Waldo has made use of pneumatic equipment that is unorthodox in the plumbing trade.

One such device is a 2-ton, double-spindle threader with an automatic air chuck. The equipment was purchased after the president of the company, Ralph Phillippi, saw similar machines in a west-coast nipple factory. Now, his Phoenix facility has two of these units, each with automatic air-operated vises. The smaller is used for ½- and ¾-inch water and gas pipe and can thread as many as 450 joints per hour. It was first used in 1955 when the firm installed piping for a 1000-home development in San Manuel, Ariz. Reportedly the machine has recovered the initial cost of \$3500 many times over. So successful was the pneumatic chuck on the smaller threader that a larger unit, similarly equipped, but capable of threading 1¼-



### AUTOMATIC THREADER

Air-actuated chucks take much of the hard work out of machine threading of pipes. The 2-spindle Hill Acme rotary head threader shown here has special air-operated chucks and is used for 1¼- and 1½-inch vent piping. Operating at a rate of about 250 pieces per hour the machine, as well as another older unit, reportedly paid for itself in direct labor savings in a very short time. The levers shown control both the chuck and the pipe advance. One man operates the machine.

and 1½-inch vent piping at a rate of 250 pieces per hour, was purchased.

Each unit can cut threads on two pipes almost simultaneously. The operator stands between the two spindles. Close at hand are two handles, each controlling one of the power chucks. When the tubing is dropped into a vise or chuck, the operator merely pushes its corresponding control handle forward and the clamp closes on the pipe at a set point. As the worker continues to move the handle forward, contact is made with revolving dies, and the threading and reaming is completed automatically. While that pipe is being threaded, the worker repeats the operation with another pipe, using the other die head. By the time the second piece has been inserted in the chuck and started on its course, the first will have been completed. The mechanic then retracts the handle to the same point at which the vise had taken hold before, and the pipe is released.

Each machine, adapted to Waldo's use by W. F. Obear & Son, of Inglewood, Calif., the firm's equipment supplier, has two Landis die heads. According to Phillippi, it formerly required a 6-hour day to fabricate pipe for an average-sized new house. With air-operated chucks and the new threaders, his men are able to turn out, in the same length of time, enough pipe for ten similar houses.

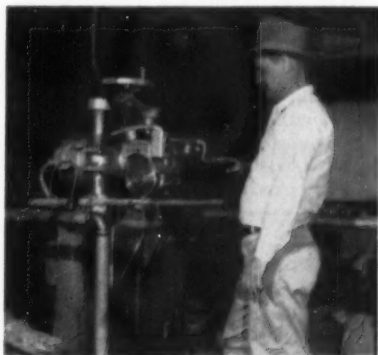
Waldo reports an increase in production amounting to as much as 100 percent by the use of air-operated caulking hammers. The design of the hammer is such that it has lessened fatigue and reduced the number of skinned knuckles.

In addition to the pneumatically operated pipe threaders and caulking hammers, the concern makes use of an air-operated rolling pipe cutter. It has an electrically operated wheel that revolves slowly but constantly, being set

by the operator at a point usually from ⅛ to ¼ inch above the pipe. The tubing is pulled through grippers until the desired length protrudes. The operator then actuates an air-operated arm, and the wheel cuts the pipe in less than 2 seconds.

Phillippi has improvised a 4-wheel trailer mount to move his equipment to jobs located outside the Phoenix area. He has four of these and each is equipped with such items as a 10-kw generator, a 5-hp air compressor, an abrasive saw, a pipe threader and hoses to operate air hammers. They are generally hitched to pick-up trucks for delivery to job sites.

Phillippi and his equipment supplier assert that air-operated equipment is, in many cases, easier to maintain than mechanically operated varieties. Frequently, all that is involved in air-cylinder maintenance is the replacement of a simple cylinder cup. Whenever the chuck on a machine is of the lever-operated, quick-acting type, it is advantageous, they report, to install automatic air chucks.



### ROLLING PIPE CUTTER

The air-powered, rolling pipe cutter above has many advantages besides the customary labor-saving attribute of pneumatic equipment. Because pipes must later be threaded, a cutter works better than an abrasive wheel since it leaves no burrs to damage dies. Putting this device into operation simply requires a touch on the valve controlling the air cylinder that moves the cutter against the pipe. The electric-motor-driven cutter revolves at a constant slow speed.





# Aluminum Jacketing Protects Steam Pipelines



## PRELIMINARY INSULATING

Baldwin-Hill No. 100 pipe covering was wrapped around the pipeline system and then covered with a layer of 15-pound roofing felt. Trybee Company, Inc., performed the insulating and jacketing job.



## STEAM-CARRYING PIPELINE SYSTEM

A steam-carrying pipeline system is in operation at Esso Standard Oil Company's Bayway refinery. It is protected from the weather by a jacket of corrosion-resistant Alcoa aluminum. In one of the largest applications of its type, 80,000 pounds of aluminum sheet in thicknesses of 0.032, 0.025 and 0.020 inch were installed to weatherproof 5½ miles of insulated steel pipe.

A STEAM-carrying pipeline system that is protected from rain, snow, dirt and ice by a gleaming, corrosion-resistant aluminum jacket, is in operation at Esso Standard Oil Company's Bayway refinery. Designed by engineers from Esso and several consulting firms, the pipelines link refinery facilities and the recently completed Linden, N.J., generating station of the Public Service Electric & Gas Company. Nearly all steam required in the refinery's processing operations is supplied by the station through two 30-inch low-pressure lines and one 20-inch high-pressure line.

Steam at 462°F pushes through the larger pipe to the distributing system in the process area. In the high-pressure line, steam enters at 740°F and races to the refinery's distribution grid at the central boiler house. To conserve heat

and maintain steam efficiency, each pipeline is wrapped in mineral wool insulation, manufactured by Baldwin-Hill Company, Trenton, N.J., and jacketed with aluminum.

The aluminum application is said to be one of the largest of its type, using 80,000 pounds of alloy 3003 sheet produced by Aluminum Company of America. It shields 5½ miles of insulated steel pipe from damaging weather and a corrosive industrial-marine atmosphere.

According to Esso, insulating and jacketing the lines has cut heat loss to 5 percent of that experienced with bare pipe. An expenditure of more than \$500,000 would be required annually to replace the heat that would escape if the pipelines were not insulated.

In addition to the process steam pipelines, a 16-inch low-pressure line delivers

steam to the refinery's waterfront area, and two 8-inch steam-traced lines carry fuel oil to the power station. To keep the oil flowing, these lines have also been insulated to lock heat in, and jacketed with aluminum to keep weather out.

In performing the big insulating job, the Trybee Company, Inc., Garfield, N.J., first wrapped the lines with the blanket-type insulation, then added a layer of 15-pound roofing felt. The aluminum sheet was cut to size, shaped and punched prior to reaching the job site. When installed, the easily handled sections were drawn tightly around the felt-covered insulation and secured with self-tapping screws. Complete weather-proofing was insured by the careful overlapping of adjacent sheets.

At elbows and fittings in the pipelines, mineral wool, insulating-finishing cement and asphaltic mastic weather-proofing compound were used in place of aluminum sheet. These sections were coated with aluminum paint to preserve the neat appearance afforded the new pipeline system by the bright, lightweight jacketing.

According to a recent report by Ford Motor Company, the largest single machining job ever undertaken by that firm will be started this month when the job of reconditioning its Rouge glass plant grinding and polishing tables gets under way. The 212 cast iron tables, totalling 20,000 square feet in area, will be milled to a flatness of 0.0005 inch. It is necessary to have absolutely flat tables to assure uniform thickness in the glass. The melting and refining furnace in the plant also will be shut down for rebuilding. The furnace has run constantly since November 1954, and during the intervening time has turned out a continuous ribbon of glass 8½ feet wide and more than 3700 miles long.

## AIR-JET INSPIRATOR

**B**ASED on the familiar venturi jet, a new inspirator designed by Walter Kidde & Company, Inc., quickly inflates all types of rubberized gear such as life rafts or the emergency helicopter landing pontoons shown in the accompanying picture. Working from a stored supply of compressed air at 3000 psi, the unit requires about 2 cubic inches of air for each cubic foot of volume in the object

to be inflated. End pressure in the gear is about  $\frac{3}{4}$  to  $1\frac{1}{2}$  psi. If that is not sufficient, a topping-off supply of stored air can be furnished to boost final pressures.

The unit is speedy in operation: a tube having a volume of 38 cubic feet was inflated by one of these Inflatair units, as they are called, to a pressure of  $1\frac{1}{2}$  psi in only 4 seconds. Only four moving parts are in the device, and most have to

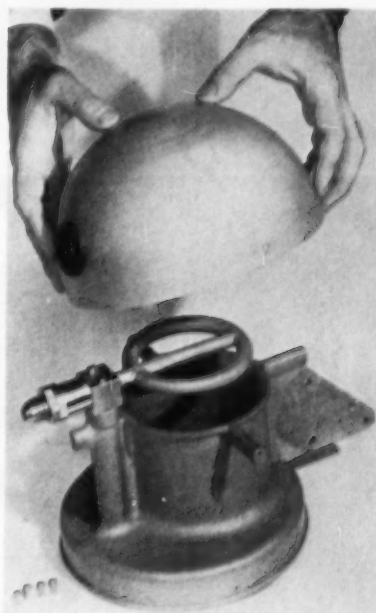
do only with valves used to actuate it. The assembly is light in weight. For example, a unit used to inflate a lifting bag (a device placed under a piece of equipment, such as an airplane, and then inflated to raise the object for servicing) weighs only 50 pounds, yet can lift a 12-ton aircraft to a height of 6 feet. They also are reportedly unaffected by salt spray, sand and dust, high humidity, vibration, fungus, rain, and extreme heat or cold.

Operation of the equipment is simple—merely pushing a button opens the control valve, and the remaining sequence of operations is completely automatic. After inflation to the required pressure is attained, the unit reaches a steady-state condition and no air flows into or out of the inflated object.



### HELICOPTER EMERGENCY FLOATS

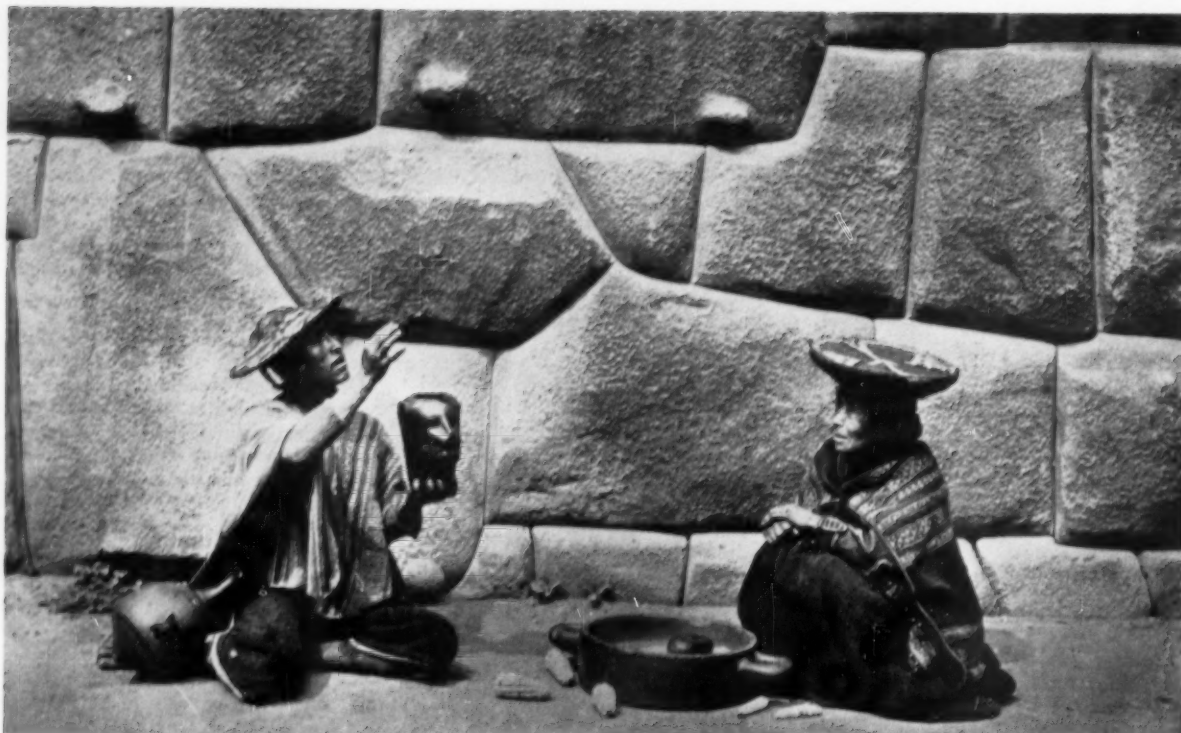
In case a helicopter is required to land on water, the airborne flotation gear units shown in these two pictures are literally life savers. There is one float and Inflatair unit attached to each wheel. (The equipment is suspended on a special cage and does not affect normal ground taxiing of the craft or interfere in any way with its operation.) This assembly is shown in the picture below. If a landing is forced over water, as shown in the simulated emergency above, either a manually or electrically controlled valve in the helicopter is tripped and compressed air flows from a storage cylinder contained in the craft itself, through hoses to the wheel-mounted Inflatairs, thus forming the doughnut-like floats shown. The units are mounted at such an angle that the craft can be taxied or towed more easily on the water. Each float has a reserve buoyancy of approximately 100 percent based on an aircraft weight of 7200 pounds. The nose floats have a volume of about 58 cubic inches each and the rear ones, about 66 cubic inches. The entire Civil-Aeronautics-Administration-approved emergency flotation rig weighs but 170 pounds and is offered as optional equipment on Sikorsky S-55 commercial helicopters.



### INFLATAIR UNIT

The Inflatair device is shown in this illustration with its protective cover removed to reveal some of the interior parts. The ring-shaped assembly at the top is perforated on the under side—it is through those perforations that compressed air at 3000-psi pressure is released. The air is directed down through the throat or venturi making up the body of the unit, entraining up to 20 times as much air as its initial volume. The base of the throat is secured around an opening in the gear to be inflated. Compressed air is introduced into the unit through a fitting, shown at the top left, leading into the ring jet assembly.





PHOTOS, THE GRACE LOG



## PERUVIAN

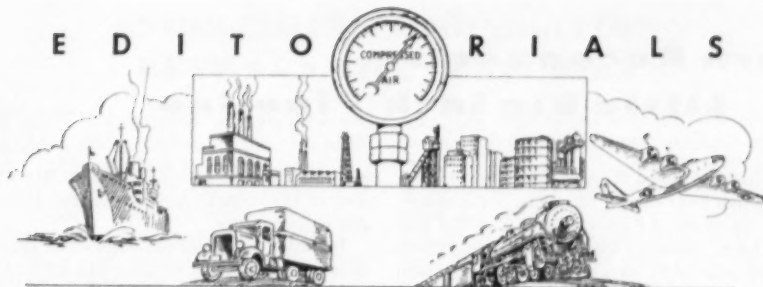
### *Portraits*

**F**AMED land of the Inca's, Peru today is a country struggling to modernize and raise its standard of living, while yet retaining its rich cultural heritage. The fabulous Incan culture is reflected in the colorful dress of the hill people, and many of the edifices erected by the ancient engineers still stand. In the fabled city of Cuzco, once the capital of the Inca Empire, Spanish conquistadors raised new buildings on the foundations of some of the Incan buildings. The pictures on this page show two scenes in the city, which lies 11,000 feet above sea level in the Peruvian Andes.

The illustration at the left shows some of the structures the Spanish conquerors put up on Incan foundations. The dress of modern tourists contrasts sharply with that of the woman standing on the corner. In the photograph above, some of the Incan handiwork is shown. The wall was put together without mortar. So carefully shaped and fitted together are the blocks in this wall that a knife blade cannot be inserted between them. All the more remarkable is the fitting job when it is considered that the stone was quarried and shaped with the most primitive of tools. In some Peruvian mountain fortresses are stones weighing more than 800 tons, placed without the aid of machinery.



# EDITORIALS



## SIDEWALK SUPERS OPEN JOB

WITH THE start of Rockefeller Center's newest addition—the \$70 million, 47-story Time-Life Building—the sidewalk superintendents have gathered again in New York City. Never have they had it so good. The plushiest grandstand for unofficial overseers ever dreamed up, a well-informed and attractive hostess, daily progress reports and even a suggestion box are provided by a sympathetic Center management.

The viewing stand is a large pavilion with red-and-white-striped awnings and eight 20-foot flag poles fitted with colorful banners. Long, comfortable benches; wide, picture-window observatories; and, of course, the hostess, complete the scene. The hostess, Miss Marilyn Miele, a city school teacher, expert in speech therapy, and an ex-Radio City guidette, has taken some instruction in the operation of excavation machinery, has been briefed on all data about the new Time-Life Building, and will know the names of all the flowers planted in and around the pavilion as well.

Even the idea of using music and recordings to entertain the watchers was toyed with, but later given up because, as one of the Center officials explained, "We felt that it would take the watchers' minds off their 'work'." Daily reports will be printed so that the supers can keep up with their job.

Many charter members of the original Rockefeller Center Sidewalk Superintendents' Club were on hand for ground breaking ceremonies July 1. According to Center personnel, official membership cards issued for the 1938-39 crew will be honored at the pavilion, or new ones for the current project can be obtained for the asking. The little blue cards bear an old Dutch quotation: "De beste stuurliu staan aan wal." It means, "The best pilots stand on the shore." All serious members of the Sidewalk Superintendents are supposed to be able to rattle off the Dutch version without stammering or stuttering.

But New York City's sidewalk superintendents aren't the only ones benefiting from the sympathetic views now taken by officials. Along the St. Lawrence Seaway a great number of so-called "Overlooks" have been established to aid tourists and local residents in getting a good glimpse of the goings-

on. In many cases put in at no small expense, the Overlooks are attracting thousands of visitors to the Thousand Islands region of upper New York State. There they are getting a good idea of what is being done with their natural resources in the area. Maps and explanatory material are available to them.

The authorities of the St. Lawrence seaway and power schemes feel it best to provide safe vantage points for sightseers, and direct them to the proper Overlooks, rather than risk someone getting seriously hurt or even killed because his curiosity was so great he would not heed a danger sign. To bring the work even closer, a closed television network has been put into operation to bring to a far distant Overlook close-up scenes of activities at Barnhart Dam, a power structure being erected by the St. Lawrence Power Authority.

## MONEYLESS JOURNEY

AT ONE time the traveling executive required a little advance notice to make an extensive trip. There were such things as packing to be attended to, of course, but the chief problem was making advance arrangements for money. He needed not only a pocketful of hard cash, but usually fortified himself well with travelers' checks too. Today's traveling men feel no strain whatever in jumping off on trips with only the money they happen to have on their persons whenever the call to go comes. It's doubtful whether the modern traveler is hardier—or better heeled at all times—than his earlier counterpart. The chief reason for his seeming unconcern is probably that he is well stocked with the ubiquitous ducats known as credit cards.

It is possible for one to make a trip without any cash at all. Airlines and railroads, for example, issue travel cards so that tickets can be purchased without cash. Or, if the traveler goes by car, all major oil companies have cards to which can be charged gasoline, oil and even tire or battery purchases. On arriving at his destination, the modern wanderer can register at a hotel, using his hotel credit card not only to pay the bill, but to cash a small personal check for miscellaneous expenses. The latter, however, won't need to include eating, because one can charge that to a card in most of the better restaurants and clubs

in major cities. If our hero is careless, having flown or taken a train, that too, can be fixed up with a credit card and a late-model automobile placed at his disposal. Even miscellaneous expenses including gifts for the wife and kiddies at home can sometimes be charged.

The origin of credit cards probably lies in the oil company charge accounts. Of the major types of transportation, the airlines were the first to originate trip-charge plans. Eating cards, it is claimed, originated with one of the clubs serving gourmets, and the rent-a-car charge plan was a natural development.

No one knows for sure the exact number of credit cards issued, or even the amounts charged against them. It has been variously estimated, however, that from 50 to 70 percent of all travelers charge some portion of their expenses. Beyond the simple fact of convenience, which in itself is probably the foremost reason that people use the cards, is their safety; one losing a card has only to notify the issuer who will immediately stop all charges against it. Cash, of course, once lost is rarely gotten back. Another reason for using the cards is that Uncle Sam requests itemized listings of business expenses before he will allow credit for them on income tax returns. The monthly statements provide a ready source of proof that the money actually was spent at the time and place indicated, as well as a handy check-list to be sure that all expenses were deducted. In fact, it appears that the only bad point about using the cards, unless one has a strong preference for using cash, is that the monthly statements still have to be honored.

## MORE ABOUT ELEMENTS

ON THIS page last month we told some of the story of the synthesis of new elements. Shortly after the magazine was published, cooperating scientists of three countries announced the discovery of element 102. The international team of scientists from the United States, England and Sweden bombarded curium, element 96, with carbon ions to make the new material. Scientists from Argonne National Laboratory represented the United States; British personnel were from the atomic energy establishment at Harwell; and the Swedish participants, from the Nobel Institute for Physics in Stockholm. Argonne Labs provided the rare isotope of curium used in the experiment, carbon 13 came from the Harwell establishment, and the work of discovery actually was done in the cyclotron at the Nobel Institute. The American and British scientists of the team have proposed that the new element be named nobelium, after the Institute. The latter, in turn, is named after Dr. Alfred Nobel, discoverer of dynamite and founder of the Nobel prizes.

## Texas Eastern Reconverts Little Big Inch Pipeline

A 1168-mile segment of the Little Big Inch pipeline, now owned and operated by Texas Eastern Transmission Corporation, will be reconverted to common carrier transportation of petroleum products. The famed line thus is to be returned to its original service after 10 years as a natural gas carrier. Company estimates call for the section of line to be in service by September. It runs from Houston, Tex., to Moundsville, W. Va., and will carry a complete range of petroleum products including liquefied petroleum gases.

The Little Big Inch was built during the early part of World War II when German submarines threatened to choke off the supply of oil to the eastern seaboard. The Big Inch was the first to be built. Twenty four inches in diameter, the line was put into operation just 1 year after its start. The Little Big Inch,

which followed it, was completed in less than a year and is 20 inches in diameter.

In 1946, the government put the two "Inch" lines up for sale, and the following year both were sold to Texas Eastern which had been organized specifically to bid on the lines. Both were then shifted to carrying natural gas. Steps to reconvert the Little Big Inch were taken in 1954. Lengthy legal and regulatory proceedings delayed start of the reversion until this June, however. The estimated cost of putting the system in shape for its new task is \$35,000,000. The pipe in the Little Big Inch weighs about 209,000 tons and will hold about 2,000,000 barrels of petroleum products. If each barrel costs, on the average, \$4, the products line will be filled with some \$8,000,000 worth of fluids in transit.

In addition to the capacity of the pipeline, the firm has a tank capacity at the

present time of about 3,000,000 barrels and an additional 1,400,000 barrels is under construction.

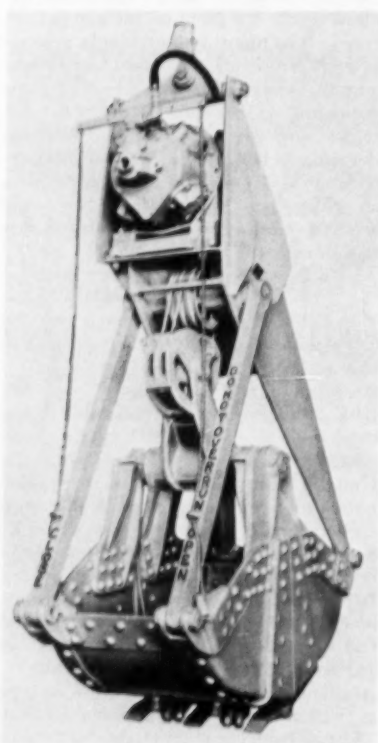
In order to construct substitute facilities to replace the natural gas capacity of the Little Big Inch, Texas Eastern will spend an additional \$61,000,000. The alternate facilities will involve the construction of 453 miles of 30-inch pipeline loops and the addition of 42,300 compressor horsepower. The work will be done primarily along the company's 30-inch natural gas pipeline between Beaumont, Tex., and Uniontown, Pa. In addition, four new compressor stations will be constructed at Gillis and St. Francisville, La.; Clinton, Miss.; and Booth, Tex. The compressor horsepower at Vidor, Tex., and Holbrook, Pa., will also be increased.

When both phases of the reversion program have been completed Texas Eastern will operate approximately 1700 miles of pipeline and 61,500 pump horsepower in petroleum products service, and some 5800 miles of pipe and 471,660 compressor horsepower in natural gas service. The products system will serve a 13-state market: Minnesota, Wisconsin, Michigan, Iowa, Arkansas, Missouri, Illinois, Indiana, Ohio, Kentucky, Tennessee, West Virginia and western Pennsylvania.

It is interesting to note that the lines and their related facilities were purchased for \$143,127,000—one of the few instances in which wartime-constructed, government-owned operations were sold for more than their original cost to the taxpayers. Upon completion of the presently authorized expansion programs, the company's total assets will be in excess of three quarters of a billion dollars.

### ROUNDHOUSE LIVING

ALTHOUGH most American roundhouses have gone the way of the steam engines they once served, at least one is the scene of bustling activity. Lithcoat Corporation, a firm specializing in the application of protective coatings, rents one from the Chicago & Northwestern Railway. The coatings concern likes roundhouse living mainly because it applies so many of its coverings to the inside of railway tank cars. The round house, fed by seventeen tracks, can handle 30 tank cars at a time. After sandblasting, the plastic resins that are the firm's stock in trade are applied, and the resultant coating baked to cure it. The baking of the interior of tank cars is done by blowing hot air through them.



#### PNEUMATIC CLAMSHELL

An air-operated clamshell—a rehandling and dredging bucket—has been introduced by Blaw-Knox Company for use with single-drum hoists in shaft-mucking, excavating and similar operations. They are available in  $\frac{3}{8}$ - and  $\frac{5}{8}$ -cubic-yard sizes, and each is equipped with an Ingersoll-Rand 7-inch-drum, overhead-controlled air hoist. With air at a pressure of 80 psi, at 124 fpm, a closing force, or lift, of 2000 pounds is exerted. The smaller unit stalls at 3200 pounds of line pull, and the larger, at 4000 pounds. According to the manufacturer, these machines have been designed with safety as a major factor—the bucket is carefully balanced, and all external edges have been streamlined.

## ENGINEERING COÖPERATION BETWEEN THE CENTURIES

**D**URING the tenth century, a reservoir and irrigation system was built in Cambodia, then known as the Kingdom of Khmer. The 88,780-square-mile area is bounded on the north and west by Thailand, on the southwest by the Gulf of Siam and on the east by Vietnam. After the middle of the seventeenth cen-

tury, the civilization was lost and forgotten until 1863, when French explorers rediscovered huge temples and palaces that had been overgrown with vines and other jungle flora. Cambodia became a French protectorate in that year and remained as such until 1955 when it achieved independence.

## SAVING WITH AIR POWER

### Pint-Size Dredge Cleans Small Basins

**A** SPECIALLY adapted air-powered sump pump has been put to work cleaning cooling-tower basins and saves its user more than \$4500 a year. A West Coast chemical manufacturer has five large cooling towers, each having a holding basin 100x500 feet containing an average of about 4 feet of water. An accumulation of sand and sediment that was pumped or otherwise carried into the basins must be removed once each year.

By manual methods it used to require 500 man-hours to clean one of the ponds. In an attempt to cut down the time required, the company resorted to air power. An Ingersoll-Rand Size 25 sump pump fitted with a special inlet was mounted on a 2-wheeled carriage. The outfit works in much the same way as a dredge, carrying the sediment out in a water suspension. The operator, wearing fisherman's waders, walks along in the basin pushing the cleaner ahead of him. A helper, similarly clad, follows him, feeding and guiding the discharge and air hoses. (The air hose floats, making his job just that much easier.) The vacuum cleaner-like device has no trouble pumping the abrasive sand which usually covers the bottom to a depth of several inches.

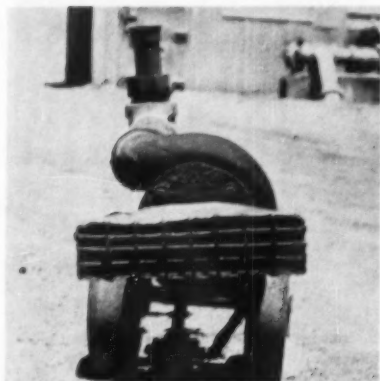
Cleaning a basin with air power can

be done in only 125 man-hours, a saving of 375 man-hours per basin or 1875 hours on all five ponds. The company's hourly labor charge for the task is figured at about \$2.50, thus a labor saving of \$4687.50 is realized during a year.



#### SUMP PUMP DREDGE

The photograph above shows the Ingersoll-Rand Company sump pump on its 2-wheeled mounting. In operation, the device is pushed along by an operator wearing waders. Another helper follows him to handle the air and discharge hoses (not shown). The other picture is a close-up of the specially fabricated intake. The grill-work blocks any debris large enough to choke the pump.



Evidence of reservoirs, canals, artificial lakes and waterways led archeologists to believe that the Khmer race was an advanced one. This was confirmed in 1954 by engineers from the United States. After examining the system, they stated that few modern techniques could improve it.

This year, American equipment and technological advice is being given to the Cambodian ministries of public works and agriculture to rebuild the system. It is hoped that when the repair work is done, 37,000 barren acres will once more become productive fields. The costs are to be shared equally by the two governments. According to preliminary estimates, a minimum of equipment will be needed for the job because of the original system's great durability. The implements will include about twenty vehicles, twelve tractors, two concrete mixers, a bulldozer and a mobile repair shop.

When built in 900 A.D., the structure consisted of two large reservoirs: an eastern one called "baray oriental," and the other known as "baray occidental." Only the latter will be rehabilitated and the original 3x5-mile size will be maintained. Its clay walls will be rebuilt and strengthened where they have crumbled. Then the debris of the ages will be scraped out, and the whole structure will be deepened. Eventually the original capacity of nearly 2 billion cubic feet of water will be reached.

The system included numerous diversion and tributary canals complete with dikes and minor dams. These too will be restored, as will the original major dam on the Siemreap River. It is believed that the restoration program will double the crop output of Cambodia and will provide sanitary wells for drinking water. It is also said that it will aid in the control of malaria. However, it will destroy neither the artistic nor the archeological treasures of the ancient kingdom.



"Let's move—this scoop is making me nervous!"



## This and That

### Transporting Transformers By Railroad

Westinghouse Corporation has developed a plan for carrying its large transformers by railroad cars. In essence, the unit becomes an integral part of the car. The equipment consists of two separate double-truck platforms that support the end sections of a web truss. The end sections hook onto the transformer case, which in turn becomes the center truss member. The effect is one of a drop-center railroad car. With this method, an additional 2 feet of height clearance is gained, and units weighing as much as 500,000 pounds can be transported.

★ ★ ★

### Safety Council Record

According to the National Safety Council, workers employed by member companies had fewer injuries in 1956, and the ones they had were less severe than in previous years. Thirty of the 40 basic industry classifications either reduced frequency rates or maintained their standing, while half of the 40 cut their severity rates or remained the same. The average injury frequency rate for employees of all industries submitting reports was

6.38 per million man-hours worked. This was a reduction of 8 percent from the previous years, and was the second time that the all-industry per-million rate was less than 7. The average injury-severity rate, based on the number of days lost per million man-hours, was 733—a 10-percent reduction. The communications field led in both columns—was low in both with a frequency rate of 0.99 and a severity rate of 58.

★ ★ ★

### Problems Of Space Travel

The lives of tomorrow's space travelers will depend on work being done by engineers today to develop compact, reliable, auxiliary power systems, according to The American Society of Mechanical Engineers. Auxiliary power systems are defined as those which draw their energy from some source other than a craft's main rocket or jet engine. The occupant of a space vehicle will be dependent on them for heat, communication, course correction, pressurization, simulated gravity (if necessary) and many other necessities. Although early models of rockets and ramjets required comparatively little auxiliary power (which could usually be supplied by storage batteries),

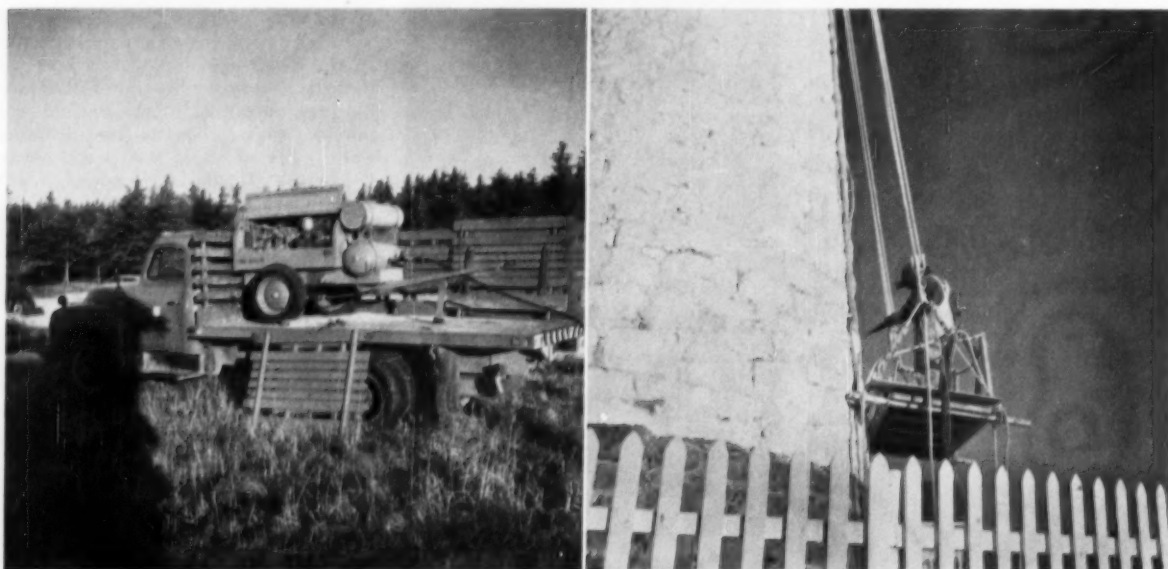
today mechanical power is needed for fuel pumps and for refrigeration to keep critical areas from overheating, electric power is required for control systems and instruments, pneumatic power is necessary to maintain proper pressures and hydraulic power is needed to operate rudders or control tabs.

Current approaches to the problem include systems using liquid oxygen and either solid or liquid fuels. Gases created by the burning of these materials power a gas turbine, which in turn, runs pumps, an electric generator or other machines. Other systems rely on bottles of compressed gas for their energy source, while aircraft flying within the atmosphere may depend on air scooped in by the swiftly moving plane.

★ ★ ★

### Canadian Whoopers Nesting

According to a report by the Canadian Wildlife Service, nine whooping cranes have been spotted from the air at the birds' nesting grounds in the Sass River area of Wood Buffalo National Park. The park is a 17,300-square-mile refuge straddling the boundary of the Northwest Territories and Alberta. Five of the birds appeared to be sitting on nests either hatch-



### SANDBLASTING AT PEMAQUID POINT

Lighthouses, with the exception of their optical arrangements and means of supplying an illuminating beam, have changed little in the thousands of years since the Libyans and Cushites erected stone towers, at the tops of which priests maintained signal lights warning all craft of treacherous shoals or beckoning them to safe harbor. Many lighthouses of Europe are already centuries old, the ancient towers that once supported coal or wood fires being equally utilitarian for housing modern lights. While few of those in

America can boast of more than 200 years existence, many will live to a ripe old age because of the Coast Guard's preventive maintenance policies. The illustrations above, and the one on the cover, show work being done at Pemaquid Point Lighthouse on the Maine Coast. The compressor shown at the left is an Ingersoll-Rand unit delivering 85 cfm. The unit is not permanently attached to the truck because it must sometimes be moved into places or onto islands where its carrier cannot go.

ing or brooding. Nine is the largest number of the birds ever observed so early in the season, and at this time last year, only one was seen nesting. The Canadian whooper, once thought extinct, seems to be staging a comeback. There are 29 known birds in the surviving flock, 24 of which are wild and five of which are in captivity in San Antonio, Tex., and New Orleans, La. Of the latter group, three are adults that were injured in flight, and two are fledglings. Ornithologists speculate that there are other nesting grounds in the Canadian wilds and hope to locate some of them this summer.

★ ★ ★

**Changes in Titanium Production** Science has devised the first change in more than a hundred years in the production of a titanium compound, titanium tetrachloride, vital to supersonic high-altitude flight. It is necessary in the manufacture of titanium, a strong, lightweight metal whose alloys have become significant in making jet aircraft, rocket and missile parts. In addition, it has other uses. Most familiar to laymen as the smoke-producing agent of skywriting, it also has been utilized as a smoke-screening material in military operations, and as a source for organic titanium compounds and paint pigments.

Armour Research Foundation of Illinois Institute of Technology has developed a way to extract higher purity titanium at less cost and by using temperatures much lower than those required for the present method. The process opens new avenues for the use of low-grade ores, such as ilmenite, in the manufacture of titanium, according to the Foundation.

Ilmenite, rutile, or a titanium-rich slag is crushed and ground, then treated with concentrated sulfuric acid. The iron content of this solution is reduced by two controlled crystallization steps; then the remaining solution, containing predominantly titanium, is treated with hydrogen chloride and solid potassium chloride. Upon further cooling, potassium chlorotitanate precipitates and the complex salt is decomposed, yielding pure titanium tetrachloride after the first condensation of the liquid.

Since about 4 pounds of titanium tetrachloride are needed to produce 1 pound of titanium, use of the more expensive rutile in the old process contributes heavily to the cost of the end product.

In the Foundation's method, the key reaction is the precipitation of potassium chlorotitanate from the ilmenite solution and the decomposition of the precipitate into titanium tetrachloride and potassium chloride at candle-flame temperatures. While it will take some

time to fully develop the process, it is expected that it eventually will replace the high-temperature method now in use.

★ ★ ★

#### Living Under Furnace Flue Alleyways

For the past 18 months, a stout-hearted Englishman has been living in the flue alleyways beneath the furnaces of the Llanelli Steel Company, Ltd. Because his life was in constant peril, the company took the matter to the local magistrate, and an injunction was granted to restrain the flue dweller from continuing his residence. The notice was served at the trespasser's "home," however he refused to move. Now he has been ordered to appear in court to show cause why he has not obeyed the injunction.

★ ★ ★

#### Shipping Steel By Air

Recently, a vitally important shipment of steel went by air from Cleveland, Ohio, to Los Angeles, Calif. Three tons of Lukens Steel Company's "T-1" steel was relayed from distributor Mills-Wolf Steel Company to a west coast fabricator in less than 72 hours from the time the

order was placed. The cargo was carried on a Flying Tigers' cargo plane. The fabricator had been trying to locate a source of the scarce alloy—an extremely high-strength steel—to complete an urgently needed portion of the firm's guided missile contract. Because the Cleveland warehousing firm had the metal in stock, the fabricator bought the steel, contingent on immediate delivery. The order was placed at noon Saturday and was received in Los Angeles Tuesday, at 10 a.m. Prior to shipment, the steel had to be cut to exacting specifications.

★ ★ ★

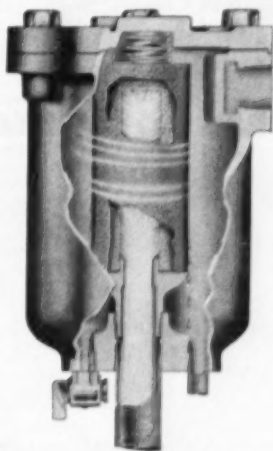
#### Detecting "Carbon-Tet" Poisoning

Medical detection of carbon-tetrachloride poisoning—potentially four times as dangerous as carbon-monoxide—may be greatly improved as a result of tests conducted by a General Electric engineering-medical team. The chemical is used in many consumer cleaning products and in various industrial solvents. Poisoning can result simply from breathing its vapors.

Preliminary investigations by the company's Instrument Department engineers and plant physician show that a Halogen leak detector will detect carbon-tetrachloride in the human system more

## ADAMS PORO-STONE AIR FILTER

designed to remove oil, water and foreign matter from compressed air lines with minimum pressure drop.



The R. P. Adams Poro-Stone air filter is engineered to efficiently remove entrained oil, water and pipe scale from compressed air lines. Liquid

droplets and solids being carried by the gas stream are first removed by centrifugal action in an annular chamber. Secondary filtration is achieved by passing the air or gas stream through a Poro-stone unit. An automatic trap can be provided to discharge the residue from the cyclone chamber.

At rated capacity the filters operate at a maximum pressure drop of only 1/2 lb., thus insuring delivery of line pressure to the point of consumption.

The units require virtually no service or maintenance — thereby insuring continued trouble-free, low cost performance.

ADAMS Poro-Stone air filters are available from stock in sizes to suit your needs. For further information, write today for Bulletin 117, R. P. Adams Co., Inc., 209 East Park Drive, Buffalo 17, New York.

Circle 16A on reply card

than an hour after exposure to relatively small amounts. The supersensitive detector—an instrument used primarily to locate leaks in tightly sealed industrial systems such as refrigerator and air conditioner units—can reportedly find a leak so small that only one ounce of gas would pass through the opening in 100 years.

The detector obtains both a quantitative and qualitative measurement of the gas present. This, according to the plant physician, has made the instrument applicable to medical uses and extremely valuable to the industrial hygienist for monitoring areas where toxic halogen gases may be used.

#### Automatic Telephone Conferences

Executive conference rooms may be a thing of the past if an experimental telephone installation in the Phoenix, Ariz., plant of The Garrett Corporation's AiResearch Manufacturing Company of Arizona proves successful. In the unique hook-up, phone conferences of as many as five executives may be called by dialing a single code number. All five phones ring at once. The system, as installed at AiResearch, incorporates 90 different combinations of persons that can be called on the conference wires. Rather than an increase in the size and complexity of the system, the new net-

work actually is smaller and more compact than older, less flexible ones. The Arizona manufacturer was chosen for the test because its sprawling plant covers some 43 acres of desert, offering an ideal "small city" site. In addition to the conference feature, the system, designed by Bell Laboratories, also includes a "clamp-on" provision whereby a person getting a busy signal may hold on until his party is through talking at which time he will automatically be connected. As many as three calls may be stacked on a given number, waiting for the busy man to answer.

★ ★ ★

#### Government Do-It-Yourself Tours of Dams

The Bureau of Reclamation has opened to the public its lower Colorado River power plant at Davis and Parker dams—on a "do-it-yourself" basis. Visitors may now take self-guided tours of the facilities any day of the year between 8 a.m. and 8 p.m. Signs and markers beginning at public parking lots direct them to the dam and powerhouse structures. Tourists may visit the generator, control and turbine floors, and by touching a button, hear a transcribed explanation of the function of all of the equipment they are seeing. It is expected that the tours of Davis and Parker will become top tourist attractions in the Lower Colorado area. Davis Dam is an earth- and rock-fill embankment with an installed generating capacity of 225,000 kw. Parker Dam is a concrete barrel arch structure and has an installed power plant of 120,000 kw. The former was completed in 1950 and the latter in 1938.

The guided tours of the facilities at Hoover Dam, 67 miles upstream from Davis, have always been popular—some 6,500,000 persons have viewed the sights there since it was opened to the public in 1937.

## GET THE FACTS..

# MAXIM SILENCERS

Dimensions, installation data, applications, all packed into Maxim's informative data sheets. Find out about the new Maxim Exhaust and Intake Silencers . . . more compact, lighter, tough as ever, and at a new low cost.

BRING YOUR FILES UP-TO-DATE NOW!



## THE MAXIM SILENCER COMPANY

Subsidiary of Emhart Manufacturing Company  
61 Homestead Ave., Hartford, Conn.

Gentlemen: Please send bulletins on silencers for: ☐ WASTE HEAT RECOVERY

☐ INTERNAL COMBUSTION AND STEAM ENGINE EXHAUST AND INTAKE ☐ AIR COMPRESSOR INTAKES AND DISCHARGES ☐ VACUUM PUMP DISCHARGES

☐ BLOWER INTAKES AND DISCHARGES ☐ STEAM, AIR OR GAS DISCHARGES ☐ JET AIRPLANE ENGINE EXHAUST AND INTAKE

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

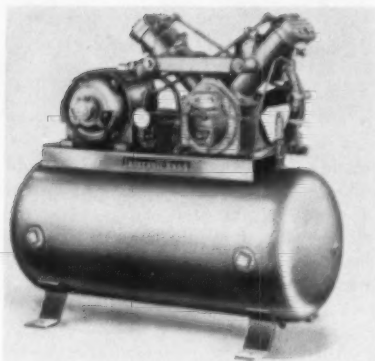
ADDRESS \_\_\_\_\_



"Not now, dear, tell me about it in the morning."



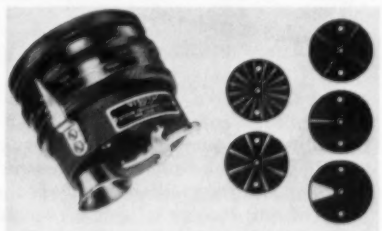
## Industrial Notes



A line of oil-free air compressors in 1/2- to 3-hp sizes, with output pressures of 25 to 100 psig, is offered by Ingersoll-Rand Company. These units feature stainless steel valves, carbon piston-ring construction, a piston design that is said to prevent crankcase oil from reaching the cylinder bore and a combined inlet filter and muffler. The non-lubricated compressors are applicable wherever oil-free air is required, such as in laboratories, and in the food, brewing, packaging, distilling and chemical industries.

Circle 1E on reply card

Visutac is a device for measuring any rotating, vibrating, oscillating or reciprocating motion. It consists of a



spring-wound motor that drives a slotted disk. Five disks are supplied with each instrument and direct or indirect readings may be taken from them. The gauge is completely portable, weighing only ounces and of slightly more than 2-inches in any over-all direction. It can be used to check rotary speeds of more than 50,000 rpm, according to Boulin Instrument Corporation.

Circle 2E on reply card

A piped fire extinguishing system utilizing Met-L-X dry powder has been developed by Ansul Chemical Company to meet demands from liquid metal users for an agent to reduce fire hazards. It is said to be designed to give maximum protection against metal fires in areas where use of manual extinguishers is impossible because of radiation hazards or because of the denser, caustic smoke

characteristic of liquid-metal fires. The system may be either manually or automatically actuated. Piping is so situated as to coat all vertical surfaces and at the same time distribute an even layer of Met-L-X over flooring to guard against fire from spilled metal. The powder consists primarily of sodium chloride that is specially compounded with materials that are both water-repellent and sufficiently free-flowing to be applied through piping systems and hoses under pressure.

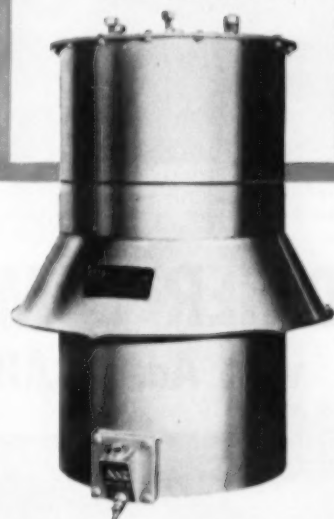
Circle 3E on reply card

Micro Switch of Freeport, Ill., a division of Minneapolis-Honeywell Regulator Company, is marketing a space-saving lighted pushbutton switch that can be mounted, horizontally or vertically, on 1-inch centers and requires only 2 1/8 inches below its mounting panel. Snap action and comparatively high force differential help prevent accidental actuations. Two subminiature single-pole, double-throw basic switching elements offer versatility of circuitry. In the switch, designated 52PB51-T2, the indicator lamp socket is fastened to the outer body of the unit and does not move when the button is pushed. This reportedly increases lamp life, since the lamp is not subjected to shocks from button actuation. Terminals of the light are separate from those of the switch, thus allowing it to operate on any desired circuit. A wide selection of translucent buttons in many sizes, shapes and colors is available, as are special incandescent lamps.

A combination instrument and machine fixture called the Derry Triangulator offers a quick solution to the time consuming compound angle set-up problem. The device, distributed by Service & Suppliers Inc., consists of two 260-degree protractors set at 90 degrees to each other with sturdy mounting plates top and bottom. By use of quick-release



## AAF Cycoil Oil Bath Air Cleaners Give Positive Protection



AAF Type "W" Cycoils have proved themselves in thousands of installations—even where dust conditions were most severe. High collection efficiency and virtually maintenance-free operation have made Type "W" Cycoils favorites in all industries.

The operation of the Cycoil is unique. A combination of oil impingement, centrifugal action, and filtration results in practically 100% dust removal in standard A.S.H.V.E. tests. Would you like more information? Write for our illustrated catalog.



### American Air Filter

COMPANY, INC.

402 Central Avenue, Louisville 8, Kentucky  
American Air Filter of Canada, Ltd., Montreal, P. Q.

Circle 18A on reply card

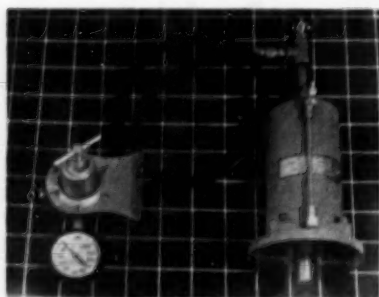
(249)

ADV. 21

clutches, any compound angle on a spherical arc can reportedly be quickly set, locked and adjusted to within one minute of arc accuracy. The unit, manufactured by Oviatt Engineering & Manufacturing Company, is especially applicable for checking, drilling, grinding or boring operations requiring repeated set-ups. The instrument is available in two sizes with 90-degree-load capacities of 150 to 300 pounds. Common-axis center-of-gravity rotation is said to prevent sag or sway by reducing load leverage to an absolute minimum.

Circle 4E on reply card

Dayton Rogers Manufacturing Company has designed a pneumatic die cush-



ion of all-steel construction that is adaptable for all types of inclinable presses

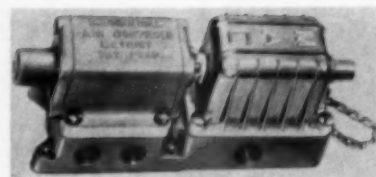
within its capacity. Designated as Model RD, it is said to be easily and quickly installed by drilling and tapping one hole, either in the bolster plate or die shoe. The equipment is furnished with a combination regulating valve and pressure gauge, along with all the necessary fittings for installation. It may be connected to any shop airline. Six sizes, ranging from 2 to 6 inches with drawing holding pressures from 0.2 to 1 ton, are available.

Circle 5E on reply card

Cratex Manufacturing Company has announced a method of dressing and cleaning metal-bonded diamond wheels with rubberized abrasive blocks. It is reportedly fast and effective in removing smear metal. Because of its cushioned action, the block "flows" around the diamond particles, cleaning with minimum danger of knocking the expensive stones loose.

Circle 6E on reply card

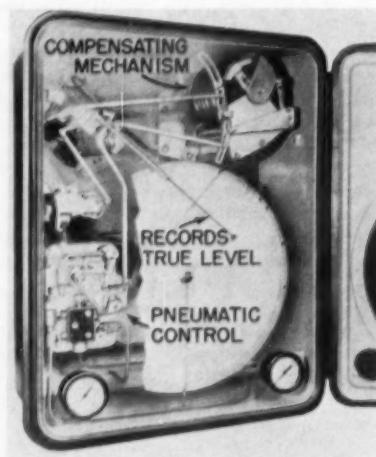
Mechanical Air Controls has announced a valve, featuring an independent body and solenoid. Because each can be removed without disturbing the other, electrical and mechanical repairs and part replacement are simplified. Reportedly the unit meets all J. I. C. (Joint Industrial Committee)



standards. Available in 3/8-inch single, double- and 3-way models, they feature a compact, integral conduit box and shock resistant mountings. Its air chamber, spool and engineering are identical with all other MAC valves.

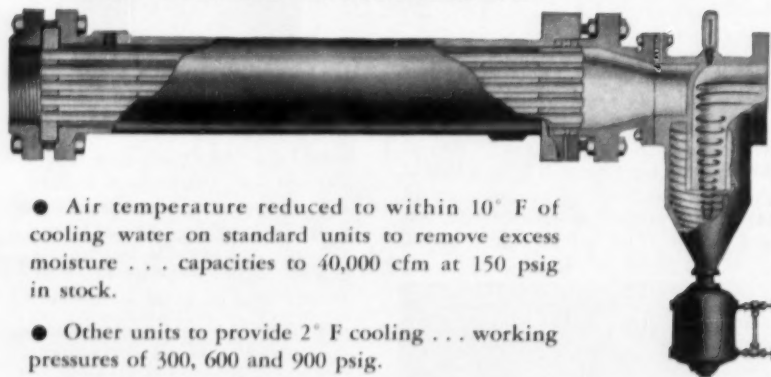
Circle 7E on reply card

Automatic compensation of drum-level measurements over the entire boiler operating range is featured in Bailey



Meter Company's level recorder. A Bourdon helix compensator continuously readjusts the pen to record true drum levels. Operating from drum pressures, the compensating mechanism offsets the effect of any change in specific weight of the water, at saturation conditions, giving complete compensation over entire ranges of level, pressure and temperature. It can be used in boilers that have rated pressures above 900 psig and reheat boilers that must perform for many hours below operating pressures during the starting period. Level measurement ranges from 0-12 to 0-70 inches of water in the drum at a maximum service pressure of 3500 psig. The pressure compensator has a range of 0 to 2500 psig. Circle 8E on reply card

## DRIER COMPRESSED AIR with Adams Aftercoolers



- Air temperature reduced to within 10° F of cooling water on standard units to remove excess moisture . . . capacities to 40,000 cfm at 150 psig in stock.
- Other units to provide 2° F cooling . . . working pressures of 300, 600 and 900 psig.

## and Cyclone Separators

- Effectively remove condensed moisture entrained in air leaving aftercooler . . . high separating factor over a wide range of flow rates.
- For full details on Adams Aftercoolers and Cyclone Separators, request Bulletin 711.

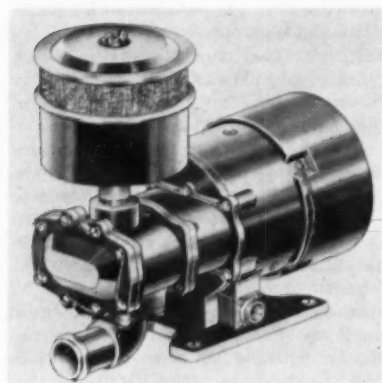
**R. P. Adams Co., Inc.**

209 East Park Drive, Buffalo 17, New York

Circle 19A on reply card

Pesco Products Division of Borg-Warner Corporation has announced an oil-free, dry-air pump, Model 133218, that features practically zero clearance without rubbing at the tips and ends of its impellers. According to the manufacturer, the machine is rated at 40-cfm-pressure delivery at 7500 rpm. Higher pressures and increased flow are possible. The unit is exceptionally compact and

weighs only 5½ pounds. As supplied to the U. S. Air Force for inflating paraballoon radar installations, it is equip-



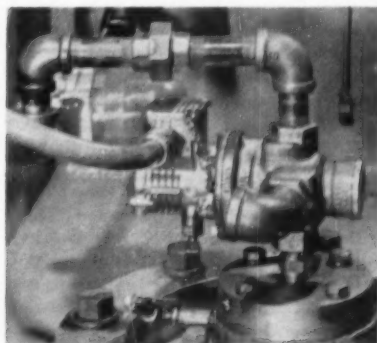
ped with an air cleaner and a 400-cycle, alternating-current Pesco electric motor.

*Circle 9E on reply card*

A line of diaphragm-operated high-pressure control valves designed for automated control in oil, air, steam and hot- or cold-water service at pressures up to 6000 psi has been developed by Sinclair-Collins Valve Company. These fixtures are said to provide extremely long service life and maximum ease of maintenance. Because valve stems are made of Monel metal, bodies of cast Navy M bronze or hi-tensile alloy billet bronze, and seat sleeves of hardened stainless steel, the units are resistant to corrosion. Parts are completely interchangeable.

*Circle 10E on reply card*

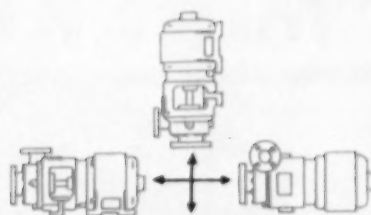
Hi-Speed Inlines are a series of 2- and 3-way poppet-type in-line control valves. According to Valvair Corporation, they are said to provide split-second response as a result of extremely short poppet travel. This shortens machine cycle time and correspondingly increases work output. The fixtures have three moving parts, and the poppet is air-cushioned. Sizes range from ¼- to 1-inch NPT (National Pipe Thread) for working pressures of 10 to 200 psi.



*Circle 11E on reply card*

you get

**versatility** too



Plant engineers and operating personnel who have had experience with Ingersoll-Rand Motorpumps have found ease of installation of special importance and an extra advantage over and above Motorpump efficiency, dependability, stamina and low overall maintenance.

Motorpumps are compact to save space, they operate in any position, they present no alignment problem, need no baseplate or coupling.

These are important points to consider when you want a pump. See your local Ingersoll-Rand representative or write for the complete bulletin on Motorpumps.

**Ingersoll-Rand**

11 Broadway, New York 4, N. Y.



9-590

**MOTORPUMP sizes ¼ to 75 hp / capacities to 2800 gpm / heads to 650 ft**



# "MINE KING"

*The Name to  
Remember When  
Buying Air Hose*



## FLEXIBLE!

Easier to handle under crowded, tight-spot drilling conditions, and when coiling for movement between locations.

## LONG LENGTHS!

Availability in long lengths . . . up to 500 feet . . . permits "Mine King" to be used with fewer intermediate connections, reducing the time required for coupling and uncoupling.

A Goodall "Standard of Quality" product, "Mine King" can be relied upon to carry a full, uninterrupted supply of power to rock drills, pavement breakers and other air tools, and to stand up longer under severest wear and abuse. It will pay you to buy and use it! Sizes  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1".

*Contact Our Nearest Branch for Details and Prices  
If it's GOODALL, it MUST be Good!*

Standard of Quality—Since 1870



HOSE • BELTING • FOOTWEAR • CLOTHING  
AND OTHER INDUSTRIAL RUBBER PRODUCTS

## GOODALL Rubber Company

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.  
BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES.  
IN CANADA: GOODALL RUBBER CO. OF CANADA LTD., TORONTO.

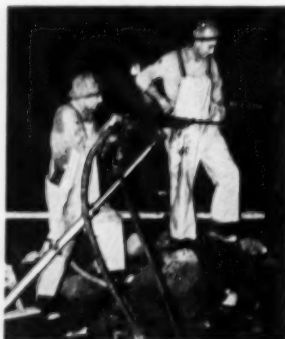


## STRONG!

Molded—and—braided construction, with materials and workmanship meeting the very highest standards for quality and reliability.

## TOUGH!

Extra durable smooth brown cover withstands severest abrasive wear; resists the shock of falling rock, tools and timbers; and prevents penetration of water into carcass.



## BRIEFS

Reflecting the concern of many of its members with the national water situation, the American Society of Civil Engineers has named a special Task Committee on Water Resources to study the organization's technical activities in that field and to report to the Board of Direction certain recommendations aimed at developing its activities in the field. The Task Committee is hoped to produce ideas that will further the protection of water resources and thereby enhance the national welfare. The 6-man board, headed by Wesley W. Horner, a former president of ASCE, is made up of a cross section of American engineers concerned with the development and conservation of water resources.

A report by the Department of the Interior indicates that an adequate supply of irrigation water for western projects seems assured this year. Rainstorms have filled or partially filled most of the reservoirs depleted by nearly 4 to 6 years of drought in the area. Many reservoirs in the 17-state area are full, it is said, and a few even are spilling over. As rainstorms continue, the Bureau will operate some as flood control pools as well as storage reservoirs. As an example of the rains that have broken the long drought, the fall on the Upper Colorado River watershed has been 147 percent that of normal years, and during the month of May was 246 percent of that in normal Mays.

Magnetic "fields" not only play an important role in the operation of communications equipment made in the various General Electric plants, but extend into the production areas as well. In the place of tweezers, a small U-shaped magnet is worn as a ring. It simplifies assembly of tiny parts in precision manufacturing. Time lost in picking up small parts from bins has been considerably reduced.

A floating oil harbor is to be located between the island of Groix and the Lorient Coast of France. Docks, placed about 2 miles from the mainland in 160 feet of water, will be sheltered by the island and enable 100,000-ton supertankers to unload. The port will be connected to the mainland by pipelines feeding a refinery built about 6 miles from Lorient.

Tidewater Oil Company's new Delaware Refinery required more than 1,000,000 pounds of nickel in alloy form, according to the International Nickel Company. Monel, Inconel, Incoloy and a variety of other nickel-bearing alloys were used not only in

fractionating towers, trays, drums and other pressurized vessels, but in some of the extensive piping as well. Cupronickel tubing of 70-percent copper, 30-percent nickel was used throughout the plant where the somewhat brackish river water is used. Type 316 (chrome-nickel) steels were used for various high-temperature (above 500°F) corrosive applications.

Lifting and carrying by manual labor costs \$10 per horsepower-hour as compared to less than 3 cents by electrically operated conveyors.

Air conditioners have made their way around the world. An American manufacturer has reported that three 200-hp units were recently installed in the Parliament Building in Baghdad, Iraq, and another in a power station there. The fifth was sent to a power station in Debris. Together, it is said that the five units could provide enough cooling power to air condition about 400 average-sized homes.

The National Bureau of Standards has experimentally produced an ultra-high-strength steel that can be heat-treated to a strength of 235,000 pounds per square inch. The new steel has sufficient ductility for structural applications and, according to its developers, since it is made by normal melting and working processes, should not be difficult to manufacture.

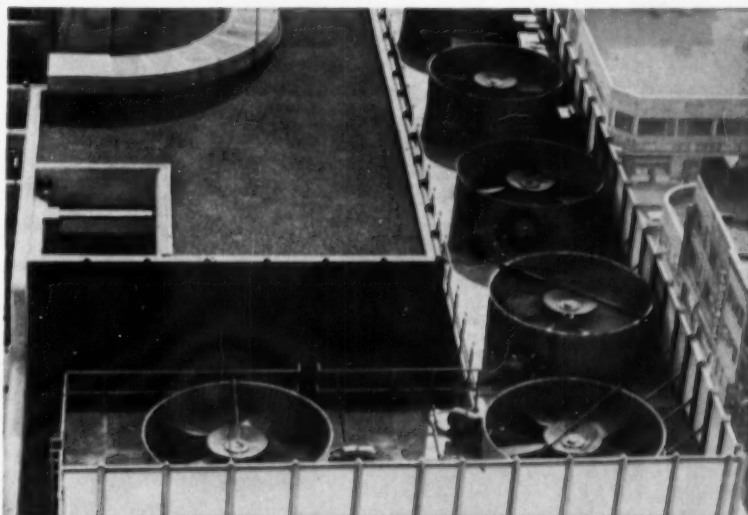
When drillers try to strike oil, it is said that the chances are thirteen to one that the hole they drill will be dry. Luck played a switch recently when an oil refinery drilled a hole into which they planned to dump their waste products. This one produced crude right in the refinery's backyard.

Eso Standard (Turkey) has begun drilling operations in Turkish Thrace at Ceylan Well No. 1, 8 miles west of the Istanbul border. This is the first test on the basis of four exploration licenses covering more than 40,000 acres. The first of these explorations was started in 1954.

What have gas and oil engines done for the average man? Until their arrival, the farmer spent almost half of his working life in the unproductive task of tending and feeding his horses and mules.

Officials estimate that 5 billion pounds of copper in the refined state have been extracted from Calumet & Hecla, Inc., mines in the upper peninsula of Michigan since the original company started operations in 1859. Calumet operates nine mines and has two exploratory shafts under construction in the area.

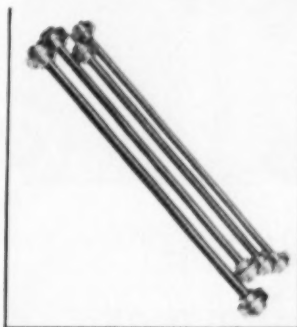
AUGUST 1957



Waldron floating shaft couplings used on nine Phillips Cooling Towers

# WALDRON

*flexible couplings...*



Waldron floating shaft shear pin coupling

USED IN HUNDREDS  
OF DIFFERENT APPLICATIONS  
BUT ALWAYS FOR THE

*same 3 reasons*

## 1 STRENGTH

—Hubs and cover sleeves for sizes 1½ A through 7A are machined from tough steel forgings. Hubs are keyed to the shafts. The two one-piece cover sleeves function as a single, rigid unit serving as a floating connecting link between the hubs. High strength of forgings makes possible a very compact coupling with low rotating inertia.

## 2 RELIABILITY

—There are no flexible parts to bend or break and the coupling is dust, moisture, and oil tight. Patented Walflex seal is at the lowest possible diameter where centrifugal force is least. Clearance between teeth in hubs and sleeve is engineered so that an oil wedge always separates them, taking the wear.

## 3 SERVICE

—Plenty of rough bore couplings, already assembled—on the shelf for immediate delivery. Finish bored standard couplings shipped to meet customers' schedules. We are geared up to give you realistic delivery on any type of couplings.

Ask for Catalog 57

# JOHN WALDRON CORP.

NEW BRUNSWICK, NEW JERSEY

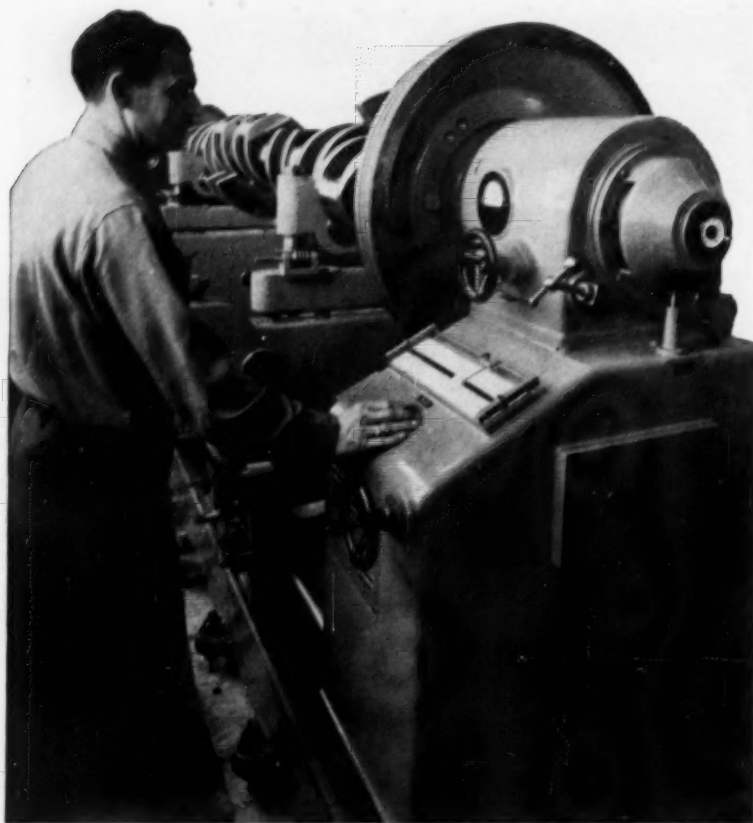
Representatives In Principal Cities

Export Agents—Frazar & Co., New York, N. Y.

Circle 22A on reply card

(253)

ADV. 25

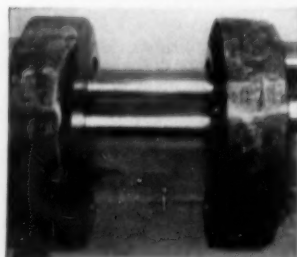


## THIS REBUILT CRANKSHAFT IS DYNAMICALLY BALANCED BY A NATIONAL FORGE SPECIALIST

The same close tolerances that we apply to new crankshafts govern your National Forge *reconditioned shafts*. They, too, are dynamically balanced to *original requirements* after they have been straightened, ground, chromium plated, and ground and polished.

Because National Forge is a specialist in both new and reconditioned crankshafts, we can guarantee your rebuilt shaft will meet the original shaft's specifications.

May we quote on your next job?



This is a finished, repaired crankshaft after processing by National Forge.

For more details on crankshaft repair, write for Bulletin RC-4

**NATIONAL FORGE**  
AND ORDNANCE COMPANY  
IRVINE, WARREN COUNTY, PA.

### Industrial Books, Films and Literature

Ingersoll-Rand Company's bulletin Form No. 7062-C describes its line of Class GT 2-stage general-purpose centrifugal pumps. Built in six basic sizes ranging in capacity from 100 to 3500 gpm, pressures to 450 psi, heads to 1100 feet and temperatures to 300°F, they are horizontally split to permit complete accessibility to all internal parts without disturbing the piping. The smaller sizes feature single-suction impellers that are mounted back to back, with inlets opposed, thereby neutralizing axial thrust. The larger units have double-suction impellers and are said to also provide thrust-free operation.

Circle 12E on reply card

The Gray Iron Founders' Society, Inc., 930 National City—E. 6th Building, Cleveland, Ohio, has released a 57-page manual on *The Machining and Grinding of Gray and Nodular (Ductile) Cast Irons* by Norman Zlatin and Charles F. Walton. It is intended for use in the design, engineering and production of cast components. Part I includes chapters on the selection of tool materials, grinding cutting tools, machining applications, properties of iron castings, economics of machining and general machining recommendations. The second section covers types of finish grinding, honing and lapping. Price \$3.00.

*Handbook of Powered Industrial Trucks* will be published this September or October, according to Industrial Truck Association, Ninth and F Streets, Washington 4, D.C., and advance orders may be placed now. The 94-page book, the first such manual to detail all types of powered industrial trucks, is the result of more than 2 years of combined effort by various Association committees. The book is divided into five sections covering selection, procedures and operation, and 20 pages are devoted to engineering data. Price, \$5.00.

The latest technique of repairing aluminum honeycomb structure under field conditions is demonstrated in a recent color film available to industry on a limited basis from the Presentation Section, The Martin Company, Baltimore, Md. A 6-inch puncture in the trailing edge of a wing is repaired by two men whose tools and materials are all carried in a single cart. The 4-hour operation is reduced to its essentials in the film which runs 10 minutes. It shows the removal of damaged material, the application of adhesive in the void, bonding a patch over the hole, and checking the bond. Cleanliness is stressed throughout.

Circle 23A on reply card



Accurate, sensitive and easy-to-read mercurial barometers and gauges are covered in Flyer No. D-2, issued by Precision Thermometer & Instrument Company. Illustrated and described are Princo mercurial barometers, with scales graduated in both inches and millimeters for use from sea level to 3000 feet and 12,000 feet in laboratories, factories, mines, power plants and weather observatories; mercurial vacuum gauges of the central-station type, with verniers mounted on sliding carriages for rapid adjustment; vacuum pump gauges that provide a means of measuring vacuums to  $\frac{1}{16}$ -inch absolute pressure; and an absolute pressure gauge for turbine condensers and exhaust hoods afloat and ashore, with sealed construction to prevent mercury contamination thus increasing accuracy in service.

Circle 13E on reply card

A 16-page technical booklet describing properties and applications of fluorinated hydrocarbon solvents for industrial cleaning jobs ranging from immersion and vapor cleaning of electrical motors and electronic equipment to general laboratory maintenance, is available from the Du Pont Company. Separate sections of the technical booklet are devoted to a general discussion of solvent properties, including data on Kauributanol values of most commonly used industrial solvents; safety characteristics of the Freon solvents, including nonflammability and low toxicity; their effect on materials such as metals, elastomers, plastic materials, magnet wire coatings, paper insulation and surface coatings; and information on stability under a wide range of operation conditions.

Circle 14E on reply card

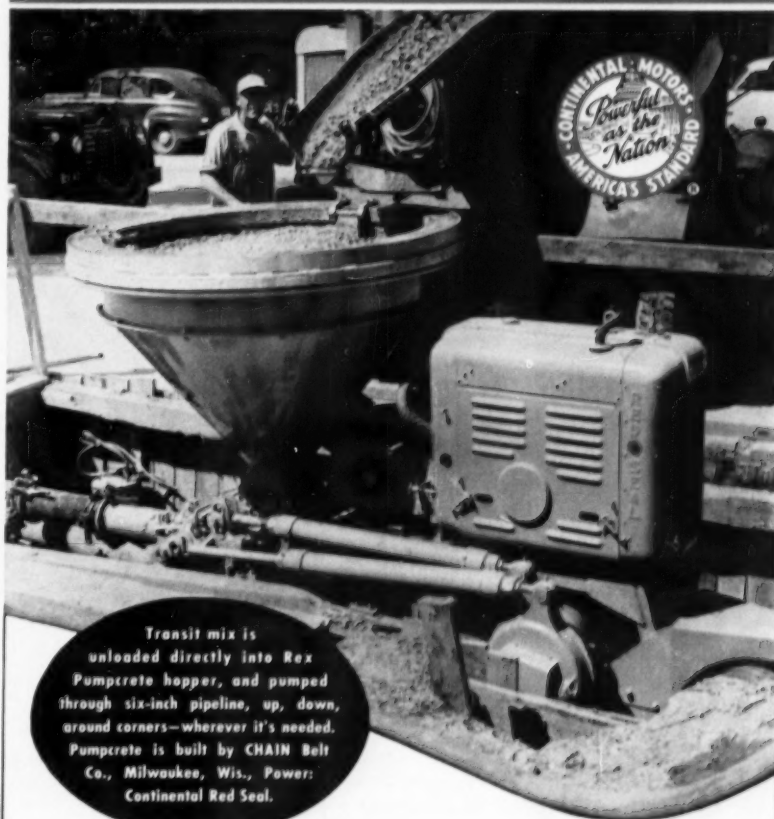
*Standard Samples and Reference Standards*, Circular 552 (second edition), issued by the National Bureau of Standards, contains a descriptive listing of the various standard samples issued. A schedule of weights and fees, as well as directions for ordering, are included. Summarized tables of analyses are presented to indicate the type of standards of composition presently available. The standard samples are materials that have been carefully analyzed, or whose physical properties have been precisely determined, at the bureau and other laboratories. Copies may be obtained by writing to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Cost, 25 cents.

A 44-page bulletin (No. A 130) about pneumatic control instruments and featuring general automatic control theory has recently been published by The Bristol Company. Described in simplified terms and illustrated are basic concepts of narrow band, proportional, reset, derivative and reset plus deriva-

# Pumpcrete Speeds the Job

with

## DEPENDABLE RED SEAL POWER

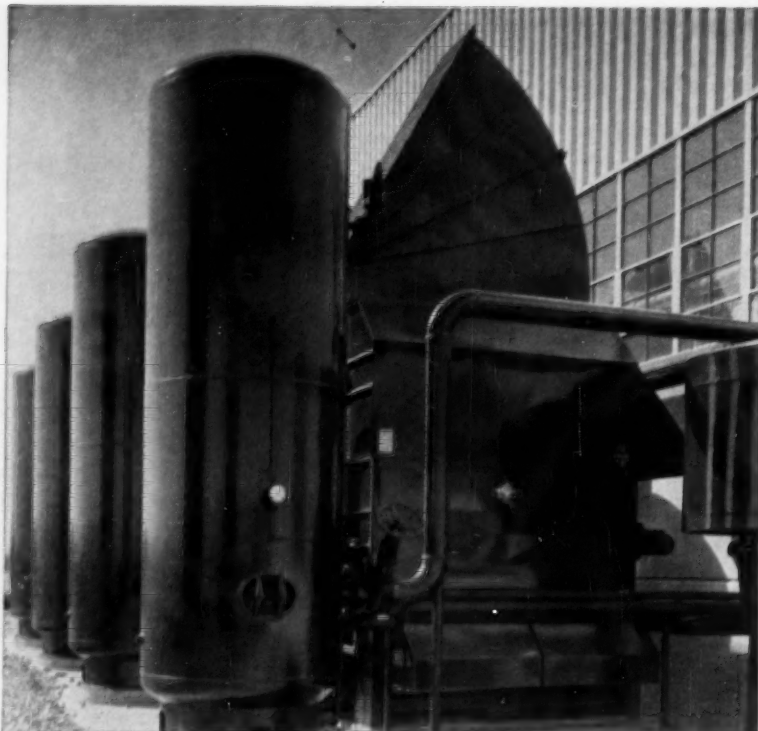


Transit mix is unloaded directly into Rex Pumpcrete hopper, and pumped through six-inch pipeline, up, down, around corners—wherever it's needed. Pumpcrete is built by CHAIN Belt Co., Milwaukee, Wis., Power: Continental Red Seal.

Convenience, speed and low cost are some of the advantages of the Pumpcrete concrete placement system over conventional scaffold-and-buggy methods. Costly and time-taking preparatory steps—erection of scaffold, elevators, runways, trestles and towers—are eliminated. The Pumpcrete unit can be located without reference to the final destination of the mix, because quick-change couplings permit lengthening and turning of the line to deliver exactly where needed . . . and when the job is finished, there's no dismantling to be done. Concrete delivery by Pumpcrete is one of many construction operations performed most dependably, at lowest cost, by Continental Red Seal Power.

WORLD'S LEADING INDEPENDENT MANUFACTURER OF INTERNAL COMBUSTION ENGINES, CONTINENTAL MOTORS OPERATES PLANTS IN ATLANTA, DALLAS, DETROIT, MILWAUKEE, MUSKOGON, AND TOLEDO, AND IN ST. THOMAS, ONT., PRODUCING AIR-COOLED AND LIQUID-COOLED ENGINES FOR USE ON LAND, AT SEA AND IN THE AIR.

**Continental Motors Corporation**  
MUSKOGON • MICHIGAN



## HOW YOU SAVE, Getting Drier Compressed Air

● Direct saving in the cost of cooling water saves the price of the Niagara Aero After Cooler (for compressed air or gas) in less than two years.

Extra, for no cost, the drier air gives you a better operation and lower costs in the use of all air-operated tools and machines, paint spraying, sand blasting or moisture-free air cleaning. Water saving also means less expense for piping, pumping, water treatment and water disposal, or you get the use of water elsewhere in your plant where it may be badly needed.

Niagara Aero After Cooler assures all these benefits because it cools compressed air or gas below the temperature of the surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air thru a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter by the Niagara Balanced Wet Bulb Control.

*Write for complete information; ask for Bulletin No. 130*

### NIAGARA BLOWER COMPANY

Dept. CA-8, 405 Lexington Ave.

New York 17, N. Y.

*Niagara District Engineers in Principal Cities of U. S. and Canada*

INDUSTRIAL COOLING  HEATING • DRYING

**NIAGARA**

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

tive control actions. Completing the bulletin are descriptions of the features of the company's line of Series 500 pneumatic recording and indicating controllers, as well as information about sensing elements used with the instruments, for measuring and controlling such variables as temperature, pressure, humidity, flow, density and specific gravity, liquid level, and pH.

*Circle 15E on reply card*

Ceco-Meyer Steeldomes for use in waffle-type, 2-way concrete joist construction, are described in a 4-page brochure issued by Ceco Steel Products Corporation. The units are removable 1-piece domes developed especially for exposed ceiling construction. They feature wide-column spacings at what is said to be a low cost because of the basic economy of 2-way construction and the saving of deadload.

*Circle 16E on reply card*

Nonlubricated bearings made from carbon graphite material is the subject of a 16-page catalogue published by Electro-Nite Carbon Company. These bearings reportedly operate under high temperatures, are chemically inert and have overcome many maintenance problems for industry. Carbon graphite bearings in operation are illustrated in ovens, process equipment, conveyors, etc.

*Circle 17E on reply card*

A 32-page booklet on stainless steel sheet and strip is being distributed by Allegheny Ludlum Steel Corporation. It contains more than twenty tables, including detailed data in a stainless steel comparative properties chart, corrosion resistance of various stainless steels, fabrication properties and weight tables per lineal foot in various widths and gauges.

*Circle 18E on reply card*

Fischer & Porter Company has published a catalogue (No. 10C150) dealing with its turbine flow meter, a device for the precise measurement of liquid flow. Inserted directly into process piping, it measures the rate of flow of a variety of liquids. The unit is designed so that it can be mounted in any position without effecting the coefficient of flow.

*Circle 19E on reply card*

Marathon Electric Manufacturing Corporation has published a new edition of *Condensed Motor Catalogue*. Essential data from its 300-page book has been reduced into a 4-page folder, covering current pricing for 1/20- through 200-hp motor sizes on general purpose fractional and integral horsepower motors. Included are slide base dimensions with diagrams and adapter information as well as standard modifications and dimension drawings.

*Circle 20E on reply card*

# EASY TO CLEAN AND INSPECT



These valves are available in either non-rising stem, or outside screw and yoke patterns.

Walworth iron body saddle type wedge gate valves are suitable for use on steam, water, gas, gasoline, oil, and many process lines. They are easy to take apart, simple to service, fast to reassemble. Walworth saddle-type valves are available in a wide range of sizes in eleven different combina-

tions of design and materials including bronze-mounted, all-iron, and ni-resist; with both flanged and screwed ends. All types can be repacked under pressure when fully opened or fully closed.

Ask your local Walworth distributor to give you complete information or, write for circular.

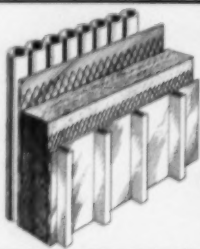
## WALWORTH

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLUX CORPORATION • GROVE VALVE AND REGULATOR CO.  
SOUTHWEST FABRICATING & WELDING CO., INC. • M&H VALVE & FITTINGS CO. • WALWORTH COMPANY OF CANADA, LTD.





**DOUBLE WALL, PRESSURE-TIGHT CASING.** The latest development in casing construction for pressure firing of boilers in the size class of the VU-55, this casing is designed to assure life-time tightness with minimum heat loss. Pressure firing permits the elimination of an induced draft fan with its attendant operating and maintenance costs. Construction consists of tangent tubes backed up successively by welded steel panels, 4 inches of high quality insulating material and an outer steel casing formed as shown to provide adequately for expansion and assure ample strength. Low heat loss and the tightness required for pressure firing are assured by this double-wall construction.

#### HIGH STEAM QUALITY.

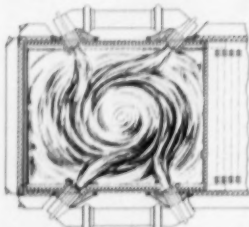
Equipped with a large (60-in.) steam drum, the VU-55 has generous water capacity and steam reservoir space. C-E drum internals assure high quality steam at all ratings.

#### TANGENT FURNACE TUBES.

The VU-55's furnace tube arrangement provides complete heat-absorbing, water-cooled protection on all furnace walls. Furnace maintenance is minimized, refractory expense is eliminated, heat absorption rates per sq. ft. are higher.

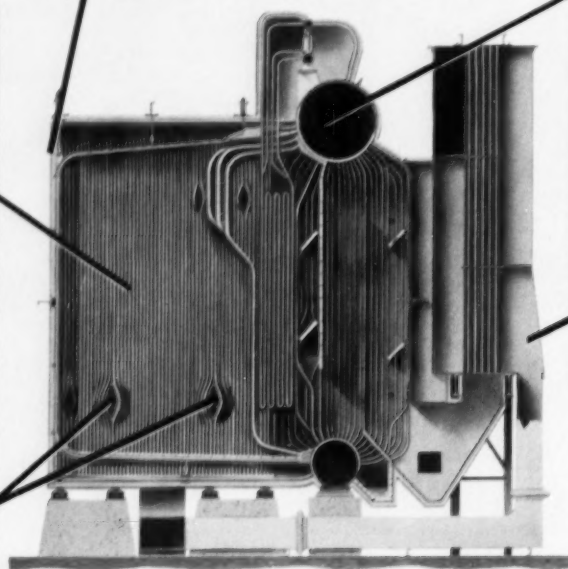
#### TANGENTIAL FIRING.

More than 20 years of application experience have established the exceptional advantages of tangential firing. About 90 per cent of Combustion's large utility installations use this advanced method of firing. Flame streams from the four burners impinge upon one another at high velocity, as shown, creating a turbulence unattainable by any other method of firing. The result is rapid and complete combustion. As the gases spiral upward, they sweep all furnace heating surfaces, assuring a high rate of heat absorption.



#### STREAMLINED EXTERIOR.

The over-all appearance of the VU-55 reflects the efforts of its designers to achieve a completely unobstructed casing, while retaining adequate access wherever required and every facility for convenient operation. There are no outside downcomer tubes, and ducts from the air heater to the burners are located beneath the furnace floor.



# The VU-55 Boiler...

*Custom Features, Standard Sizes, Advanced Design*

The VU-55, newest of the C-E line of Vertical Unit Boilers, represents the closest approach to central station performance yet achieved in standardized boilers in its capacity range.

Its design combines a number of time-tested and service-proved features, such as Tangential Burners, double wall, pressure-tight casing, and tangent furnace tubes. In addition, this bottom-supported unit requires no outside supporting steel, is economical of space and streamlined in appearance.

It is available in 5 sizes for capacities from 50,000 to 120,000 lb per hour. It is designed for 3 pressure ranges (250, 500 and 750 psi) and can be equipped with a superheater to provide temperatures up to 750 F. Either a tubular or a

regenerative air heater is available.

The VU-55 Boiler is symmetrical in design, performs efficiently over a wide range of output, and is easy to operate and maintain.

It is, in fact, the boiler with the custom features and the advanced design.

## COMBUSTION ENGINEERING



B-9786

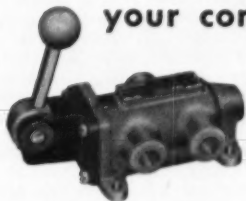
Combustion Engineering Building  
200 Madison Avenue, New York 16, N. Y.  
Canada: Combustion Engineering-Superheater Ltd.

all types of steam generating, fuel burning and related equipment; nuclear reactors; paper mill equipment; pulverizers; flash drying systems; pressure vessels; soil pipe.

# Schrader<sup>®</sup>...

## your one source for AIR VALVES

full line for every use—immediately available from  
your conveniently located Schrader Distributor



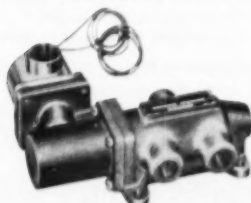
Hand-Operated Four-Way Valve



Foot-Operated Four-Way Valve



Pilot-Operated Valve



Solenoid-Operated Valve



Rotor Type Valve



Cam-Operated Valves



Flow Control Valves



Quick Exhaust Valves

Two- and  
Three-Way Poppet  
Type Valves with  
Roller Lever

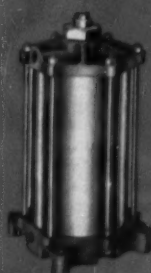


## CYLINDERS and everything you need in AIR ACCESSORIES

AIR CYLINDERS  
push, pull, single or double-acting



Pivot Bolt Mounted  
Air Cylinder



Base Mounted  
Air Cylinder

Leg Mounted  
Air Cylinder

BLOW GUNS



Button type Blow Gun



Lever type Blow Gun



Drop-Forged  
Stainless Steel Blow Gun

LUB-AIRATOR



Filter • Regulate • Lubricate  
Available separately or in combination



Couplers and Hose Fittings



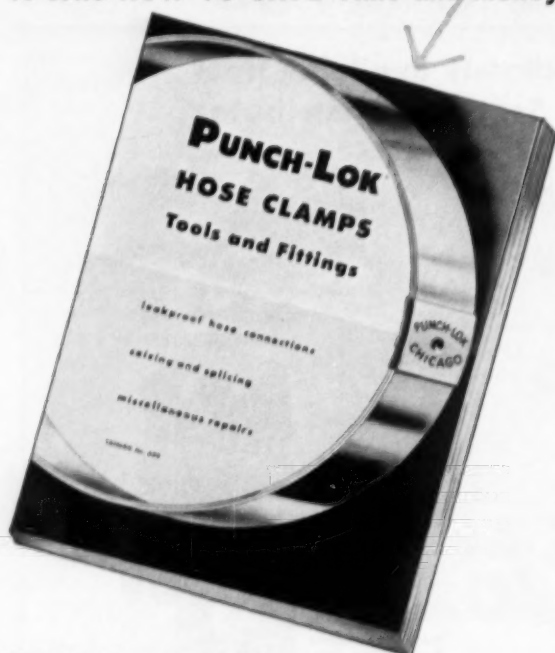
Ferrules and Tools

**Schrader<sup>®</sup>**  
a division of **SCOVILL**

Schrader's complete air products line can meet your every need.  
A. SCHRADER'S SON • Division of Scovill Mfg. Co., Inc. • BROOKLYN 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

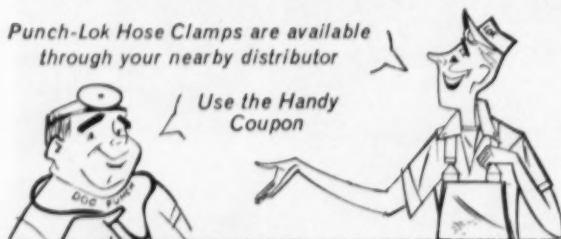
Write for this **FREE**  
New 12-page Data Book  
It tells **HOW TO SAVE Time and Money**



Every maintenance engineer in industry and construction should have this complete compilation of data on the application and use of Punch-Lok Hose Clamps . . . the perfect clamp for . . .

**Pneumatic Tool Hose    Suction and Discharge Hose**  
**Welding Hose            Seizing Wire Rope Ends**  
**Mending Split Posts, Beams, and Planks**  
**Splicing Welding Cable    Hundreds of Other Jobs**

Punch-Lok Hose Clamps are available through your nearby distributor



**PUNCH-LOK**  
Company

Dept. H 321 N. Justine St.  
Chicago 7, Illinois

Please send me a copy of your new 12-page data book.

Individual \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Circle 29A on reply card

ADV. 32

It's the **SNAP**  
in this trap  
that gives you dependable  
Compressed Air Drainage



**No Dribbling**, no air loss when you drain compressed air systems with Armstrong snap-action traps. The spring-powered valve snaps wide open for fast drainage, snaps tightly closed before all water leaves trap—always a perfect water seal. Fine dirt and grit can't lodge in valve and cause leaks. Recommended for use where no heavy oil will reach trap.\*

**Trouble-free Construction:** the flat strip string of special Swedish steel lasts for years . . . valve and seat are hardened chrome steel . . . all other internal parts stainless steel. Cast semi-steel body for pressures to 250 lbs., forged steel for pressure to 1000 lbs.

\*Heavy oil will plug up any ball float traps. Armstrong Inverted Bucket Traps are the answer to this, particularly on intercoolers, aftercoolers and receivers where large, heavy duty compressors are used.

**ASK FOR BULLETIN 2023.** Call your local Armstrong Factory Representative or write: Armstrong Machine Works, 8854 Maple St., Three Rivers, Michigan.

**ARMSTRONG SNAP-ACTION AIR TRAP**

Circle 30A on reply card

**LOW COST**  
**Preventive**  
**Maintenance**

**For Pipe, Pipe Joints,  
Fittings, Couplings,  
Tanks, etc.**



Use **TAPECOAT**<sup>®</sup>

...the Quality Coal Tar Coating in Handy Tape Form

To combat corrosion on underground pipe lines, you need the best possible protection at lowest possible cost. Since 1941, TAPECOAT has proved its superiority in resisting moisture, acids, alkalis, chemical fumes, electrolysis, soil stress, salt water and other severe corrosive and abrasive conditions. TAPECOAT is self-bonding, easy to apply spirally with the use of a torch. Requires no skilled help. Cuts maintenance and replacement costs. Comes in rolls of 2", 3", 4", 6", 18" and 24" widths.

Write for brochure and prices

**The TAPECOAT Company**

1571 Lyons Street  
Evanston, Illinois

Sales and Service Offices in Principal Cities

Circle 31A on reply card

COMPRESSED AIR MAGAZINE

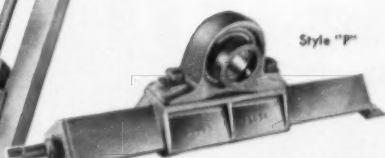


**new...**

**pre-lubricated  
take-up bearings**



Style "T"



Style "P"

**SLASH**

**maintenance costs**

Pre-Lubricated At Our Factory For Life • Seals Lubricant In—Dirt Out • Standard Series Ball Bearings • Self-Aligning • Frames of Welded Structural Steel • Can be Operated in Tension or Compression



**T. B. WOOD'S SONS COMPANY**

CHAMBERSBURG, PA.

Cambridge, Mass.

Newark, N. J.

Dallas, Texas

Cleveland, O.

Circle 32A on reply card

how to

**EVACUATE**

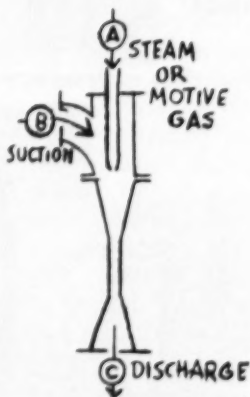
air or gases

with **NO MOVING PARTS**

I-R Ejectors make it  
as easy as A, B, C

A SOURCE of pressurized steam or air is the only motive power you need for a dependable, low cost vacuum system. A simple, I-R Ejector, with no moving parts, will do all the rest—easily meeting a wide range of applications for the evacuation of air, inert or corrosive gases.

Your nearest Ingersoll-Rand branch office or representative will gladly analyze your vacuum problems and recommend the most suitable equipment for the job. Full information on Steam Jet Ejectors is contained in Bulletin 9013-A—yours for the asking.



WHAT COULD  
BE SIMPLER?



4-656

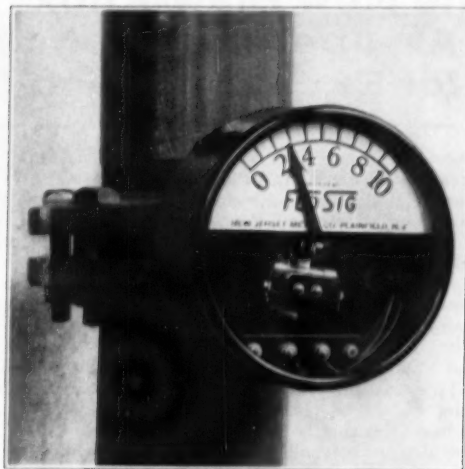
**Ingersoll-Rand**

11 Broadway, New York 4, N. Y.

Circle 33A on reply card

AUGUST 1957

**FLO SIG** The Electric Signal  
Flow Indicator that reports trouble  
before it happens.



FloSig in 6" vertical line, showing simple installation of gate ring between standard pipe flanges.

**FLO SIG** for lines carrying cooling water,  
oil, or other liquids.

**FLO SIG** for steam and ammonia condensers, transformers, generator air coolers, cylinder jackets, water cooled rolls, heat exchangers, etc.

**FLO SIG** for vertical or horizontal installation and any direction of flow. Pipe sizes from 3" up. One or two mercury switches, adjustable for any rate of flow.

**FLO SIG** for operating trip coils, valve motors, contactors, signal lights, horns, etc. on failure of flow or when flow exceeds required volume.

Write for descriptive Bulletin F-S

**NEW JERSEY METER CO.**  
PLAINFIELD, NEW JERSEY

Circle 34A on reply card

Adv. 33

*"This is the best thing I've found  
in Air-operated Clamshells"*

states James Williamson of  
Williamson Shaft Contracting Company about

## The New Blaw-Knox Air-operated Clamshell Bucket for Excavating and Shaft Mucking

These words come from a man who has been in the shaft contracting business since 1900. He goes on to say, "It loads faster and has much more closing power. I believe that its balance and streamlining make it much safer to operate."

This new Blaw-Knox air-operated clamshell bucket is suspended from a single cable, operates on normally available 85 to 100 pounds air pressure. It is controlled by a chain release connected to the walking beam type closing and opening valve.

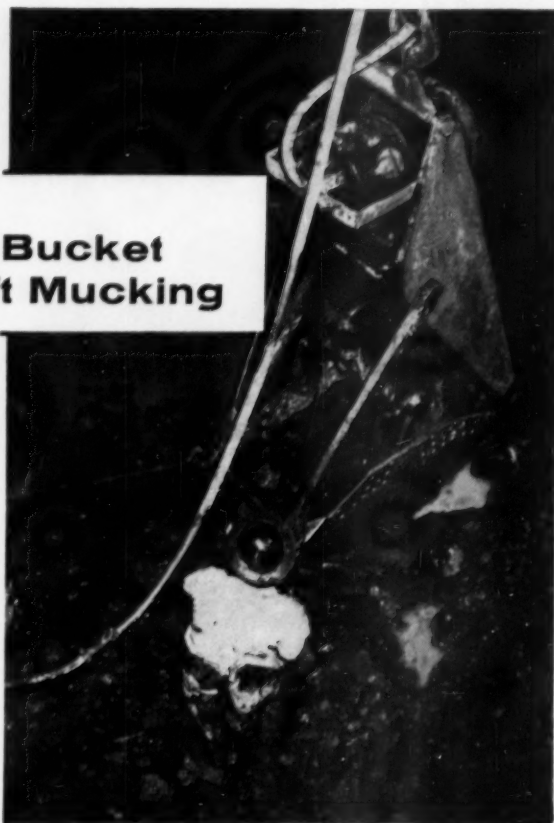
The  $\frac{1}{2}$  cu. yd. size accommodates either the Ingersoll-Rand Model H-U or Gardner-Denver Model HK air hoist. The  $\frac{3}{4}$  cu. yd. size accommodates either the Ingersoll-Rand Model H-5-U or Gardner-Denver Model HM air hoist. The hoist you specify can be factory- or field-mounted.

For descriptive bulletins or further information, contact your nearby Blaw-Knox Bucket dealer or the factory.



### BLAW-KNOX COMPANY

Blaw-Knox Equipment Division  
Pittsburgh 38, Pennsylvania



Circle 35A on reply card

## GET THE MOST OUT OF YOUR COMPRESSED AIR EQUIPMENT ... SPECIFY

## CONRADER UNLOADER VALVES

**New Models ... Smaller ... More Compact**

Positive operation in any position.

Adjustable differentials.

Operating pressures from 4 p.s.i. to 600 p.s.i.

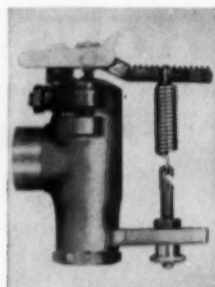
Standard on leading compressors.

Conrader's exchange service trades you a completely rebuilt valve for an old one with new valve guarantee.

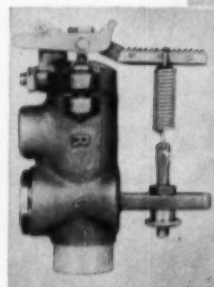
One day service on repairs.

Conrader is equipped to custom design special valves in pressures to 1000 p.s.i.

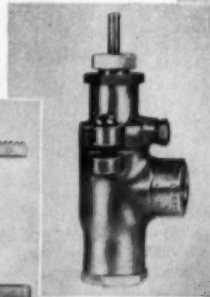
Distributor Franchises Open.



Model RCF



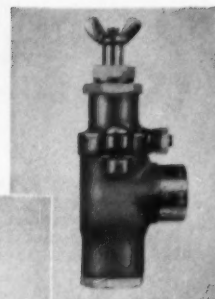
Model RCS  
(Available with drain cock)



Model RCM-A



Model RCW



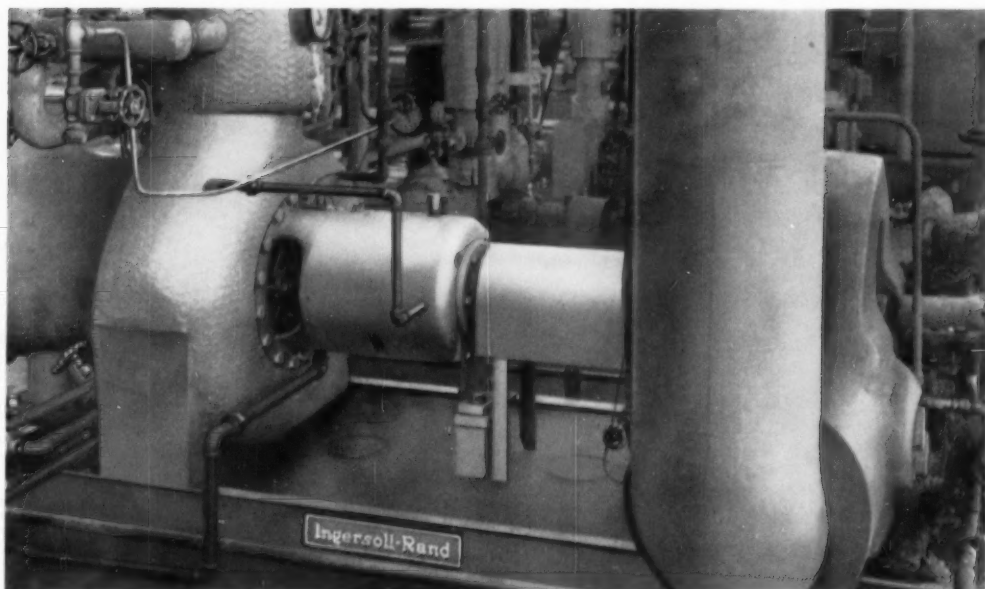
Model RCM-A  
with hand unloader

## R. CONRADER CO. INC.

Box 924 ERIE, PA. Since 1925

Circle 36A on reply card

# THIS INGERSOLL-RAND CHEMICAL PUMP MUST STAY ON THE JOB

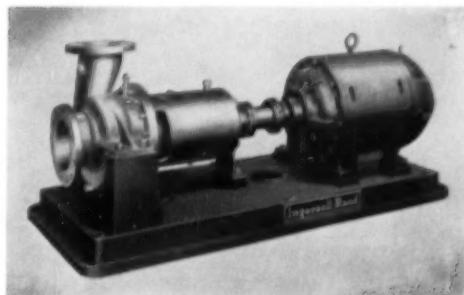


- **2 years of continuous operation**
- **Not a moment's down-time**
- **No spare pump**

This Ingersoll-Rand chemical pump is a key pump in the urea process at the Grace Chemical Company's plant in Woodstock, Tennessee. Here, the process is entirely dependent upon the pump. On stripper recirculating service, it is handling 4600 gpm of urea solution and oil at a temperature of 246°F, total head 117 ft. To withstand corrosion by the liquid handled, the pump parts are made of corrosion-resistant stainless steel.

In 2 years of continuous operation, without a spare, this pump has never been down for maintenance. Here is proven dependability in "round the clock" service.

If you are faced with a pumping problem, Ingersoll-Rand is ready to help you solve it. I-R manufactures a complete line of single and multi-stage centrifugal pumps in both horizontal and vertical designs. For further information just call or write your nearest I-R branch office.



View of class CSFL pump of the same design as shown with lagging in the installation view above. Available in 6, 8 and 10-inch sizes, they are designed for handling large capacities of hot or cold liquids at temperatures to 800°F.



## Ingersoll-Rand

10-614 11 Broadway, New York 4, N. Y.

CONDENSERS • PUMPS • GAS & DIESEL ENGINES • COMPRESSORS • AIR & ELECTRIC TOOLS • TURBO BLOWERS • ROCK DRILLS

Circle 37A on reply card



# ANNOUNCING!

## Increased capacity ratings for Timken® bearings

**T**HE Timken Roller Bearing Company announces an increase in the capacity ratings of most series of Timken® tapered roller bearings. Increases range up to 39%. Most are in the neighborhood of 10%. Some are negligible.

### Permits Use of Smaller Bearings

This increase in capacity ratings makes it possible for many of you to use smaller bearings. Your products can be made more compact. You can save weight. You may be able to reduce the size of your shafts and housings. And you may be able to use Timken bearings in new applications where they have not been practicable in the past.

### 3 Reasons for Increases

What led to these increases in Timken bearing capacities? Three things:

First, a careful review of more than 6,000 different laboratory studies of Timken bearing performance on fatigue life machines. From these exhaustive studies, conducted on an organized, scientific basis since 1924, we keep learning more and more about predicting bearing life.

Second, refinement in the method of analyzing these studies mathematically.

Third, a careful review of the life of millions of Timken bearings in the field.

### How Much Can This Save You?

To find out how the new capacity ratings affect the types and sizes of Timken bearings in which you are interested, call your Timken bearing representative or write our Engineering Department. We'll be glad to work with you at the drawing board stage. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



**TIMKEN** *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.

Circle 38A on reply card